VOL. LXXXV. No. 2186. [All Rights Reserved.] OCTOBER 17, 1919. [Registered at G.P.O. as a Newspaper and Canadian Magazine rate of Postage.] PRICE FOURPENCE.

LONDON: PUBLISHING OFFICE, 4, LUDGATE HILL, E.C.4. SUBSCRIPTION per annum, Postage, inclusive in Great Britain, £1 1s. 8d. Canada, £1 3s. 10d. ($5.80); to all other countries, 30s.—NEW YORK: D. VAN NOSTRAND CO., 25, Park Place, New York City. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. PARIS: BOIVEAU & CHEVILLET, Librairie, Etrangère, 22, Rue de la Banque.
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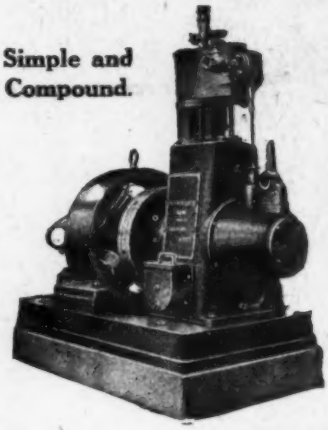

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ELECTRICAL REVIEW.

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THE IMPORTANCE OF BRITISH EXPORT TRADE.

SIR AUCKLAND GEDDES has been urging upon the manufacturers and traders of the United Kingdom the immense importance of the development of our export trade. We have written so much upon this subject, both during the war and since its termination, that we need say little more to-day. If the British manufacturer has not taken action already, it can hardly be because of want of knowledge. Many firms have order books filled for quite a long time ahead, and if in cases they have been less enterprising than they might have been, the uncertain position of affairs at Home—industrial relations—has been largely to blame. We agree with Sir Auckland Geddes, however, that there are almost unlimited trading opportunities within our reach all over the world, and if only we can "settle down" to peaceful industry here, we believe that our manufacturers will rise to the occasion. There has, of course, been a good deal of holding back because of nervousness respecting our national trade policy, and we are not sure that the President's speeches have allayed anxiety, however interesting and informing they have been as coming from Board of Trade sources.

In any consideration that we give to such matters, we must remember that the position is changing in most great manufacturing countries. Speaking generally, it may be perfectly true that America will not be so great an export rival as has been imagined during the period of the war. She undoubtedly will be up against far more serious labour troubles of her own, with consequent increased cost of production, before prevailing world movements for improving the position of industrial workers come to a close. But if we may judge her position from the special point of view of the electrical industry, we confess to being impressed by the "astounding figures" of her electrical export trade for June, as published in our last issue. We also are disinclined to belittle the £4,000,000 export scheme of the General Electric Co., of Schenectady, which avowedly is to make a strenuous bid for foreign business. It will hardly do for British electrical men to believe that America is "down and out." Sir Auckland refuses to shiver before the "danger from America." We do not want him to be cooler than he is—in some capacities we have observed that he is an icicle already. Really we suppose that the object of the speech was to encourage the British exporter, and in doing so he had first to kill the giants in the way, though he described them as "shadows" of which we were frightened. We heartily welcome the warmth with which the icicle melts as British traders are urged to remember that never have there been greater opportunities for the trade of Great Britain. The world, as we have said again and again, is clamorous for goods, and especially is it so for electrical goods of which it was deprived during the war when Germany was shut in, and our shipping was monopolised by other and supreme demands. Sir Auckland frowned upon the quality of Japanese goods,

and rightly referred to the labour movement which has found a footing in Japan. But even Japanese competition in various electrical lines is not a thing to be ignored when we remember war-time inroads made in India, Australia, China, and even here at home. It is necessary to meet this and all other foreign competition with appropriate measures, and to this end the President's advice to the business community to direct its ingenuity, energies, resourcefulness, and adaptability to developing the export trade may be very necessary. We do not believe that the competition is merely a "shadow," but we believe that it can be successfully fought if we are properly organised for the work, and determined to win. The Home trade is, of course, important, but we can attend to that surely without leaving the other undone—the immense requirements of the foreign trade should appeal to the imagination of all of us.

With regard to Sir Auckland's opinion that probably not for years to come could Germany hope to rank among the great manufacturing nations of the world, while we do not doubt that this may prove to be correct in respect of certain industries, we think it would be extremely unwise to accept the prophecy as applying to electrical manufacturing. Reference to the report of observations made by visitors to the Leipzig Fair, quoted in our "Business Notes" to-day, indicates, that probably the most important export exhibits there were those of the Technical Section, including all types of new machine tools, mechanical and electrical devices and novelties. In these branches it appeared that Germany was in a position to fill orders quickly, and, in many cases there were considerable stocks in hand, due to the fact that they were not short of iron ore and coal during the war to the same extent as industries relying on foreign raw materials. From our study of the reports of the great Teutonic electrical manufacturing organisations during the war, we are not at the moment able to regard them as likely to remain weak competitors for very long. They may not be able to do a great deal in the British Empire, but in many other markets where we ought to be operating, they will before long have to be reckoned with. They will not compete on the old terms; wage alterations have been substantial in Germany, as everywhere else, and they are not ended yet; but they are not developing their organisations for nothing. While there is, in our opinion, little in the situation to justify timidity on our part, we think we shall be committing a grievous error if we do not have our foreign trade weapons prepared in readiness for any emergency—whether from America, Japan, or European countries. Concerted action by groups is most excellent up to a point, but there are hundreds of firms outside these groups who ought to be doing a larger share than in pre-war days in building up a magnificent British electrical export trade. We are not in business for a day or two—the electrical industry, according to present signs, need know no limit to its age. Given appropriate policy and energy, it ought to grow to such proportions as to make its past appear as a wooden hut before a stately pile.

Consolidation of the German Wire Lamp Industry.

As will have been gathered from a paragraph published in our pages a few weeks ago, a scheme is being promoted in Germany which aims at the concentration in one undertaking of the entire production of drawn-wire lamps throughout the country. The project is in no sense a mutual combination of manufacturers in the form of a syndicate to control the output and prices, seeing that an agreement already exists, and has for a long time past existed, between makers on the basis of patent conventions, and there is, therefore, no intention for the moment of reviving an international syndicate for wire lamps such as formerly prevailed for carbon-filament lamps. On the contrary, what is now in view is the financial consolidation of present manufacturers—not that there are many to amalgamate.

The production of drawn-wire filament lamps has been a monopoly in Germany for a long time as a result of the licences held by the A.E.G., and shared with the Siemens and Halske Co. and the Deutsche Gasgluhlicht (Auer) Gesellschaft, for a particular method of producing the filaments; and no firm has been able to shake the validity of the patents concerned in this direction. The Wolfram Lamp Co., of Augsburg, at one time sought to establish its right to the manufacture of drawn-wire lamps on the same or a similar system, but the Courts decided in favour of the A.E.G., and the former's factory has had to be closed. Under the circumstances, there are only three makers. A financial syndicate under the lead of the National Bank has now prepared a scheme for the amalgamation of two of them, whilst, as the inclusion of a third firm is considered to be probable, it is reasonable to assume that the combination is intended to control the whole of the industry in Germany.

The scheme contemplates the formation of a company to take over the glow-lamp works of the A.E.G., and the incandescent (Osram) lamp works of the Gasgluhlicht Gesellschaft. For this purpose the financial syndicate, which obviously includes the A.E.G., has made an offer to the Auer company to purchase the latter's three classes of shares at a premium, and all the assets and liabilities would consequently be transferred to the syndicate, and the Auer company would be liquidated. In the event of the offer being accepted, the Osram lamp works of the Auer company will be separated from the other departments and transferred to the proposed new company, whilst the lamp works of the A.E.G. will be disconnected from this company, and brought into the new company. As is known, the Auer company also carries on departments for incandescent gas lighting appliances, and has a department for the utilisation of chemical products, but the A.E.G. has been unwilling to absorb the entire undertaking, or to effect an interchange of shares. Under these circumstances the above arrangements have been made subject to the approval of the shareholders in the Auer company at a forthcoming special meeting. The financial syndicate, however, has decided to continue the gas lighting and chemical departments on its own account, so that if the proposal is agreed to, as is considered probable, the interests of the shareholders in all departments of the Auer company, except in the case of one large holder, will finally terminate.

The present scheme of amalgamation of the two glow-lamp works of the two companies, which is expected, as previously mentioned, to receive the addition of a third firm (the Siemens & Halske Co.), has been prompted by the necessity which is said to have arisen for the rational utilisation of the German productive resources to the fullest extent possible. Apart from the economy which will be obtained from the combination of forces in the inland market, the amalgamation aims at attempting to meet in foreign markets the increased strength which rival makers in late enemy countries and in neutral countries have gained during the course of the war. It is fully recognised that competition in the future will be of a more intense character, and the initial step now being taken is intended to deal with the new state of affairs. There is no doubt that the shareholders in the Auer company will accept the offer, and it will then only remain for the Siemens & Halske Co. to reach a decision. If the family traditions of the latter are adhered to, the company may be expected to hold aloof from the scheme, but if such attitude is abandoned under the changed conditions of the world, the wire lamp industry in Germany will be controlled by a single company at no distant date. We have purposely omitted to mention any of the financial details of the intended transaction, and will merely state that the ordinary share capital of the dual combination will be 12,000,000 marks (pre-war £600,000), but as this by no means represents the value of the properties to be amalgamated, other capital will have to be raised in the form of debentures or loans. No intimation or suggestion is made that the scheme may be further developed so as to include in some form or other the wire lamp makers in Austria or in Holland, by the conclusion of working agreements which would represent the reconstitution for wire lamps of the international syndicate which existed some years ago for carbon-filament lamps. It would, however, not be surprising if a project of these dimensions were to be brought forward as soon as the production of lamps in Germany has been concentrated in the hands of a single company.

Power Factor.

The effect of low power factor on electricity supply conditions has received comparatively little attention in this country, owing mainly to two reasons—the importance that has attached to the lighting load, which has a very high power factor, and the general use of the direct-current system. But the conditions have changed rapidly during recent years; the power load has developed enormously, and the alternating-current system has gained in popularity, while the vast increase in the use of electricity during the war has brought the question into the forefront. In the future, alternating current will be the favoured system, and the question of power-factor improvement will have to be taken up seriously. This can be done, on the one hand, by developing the demand for supply at high power factor—for cooking and heating, &c.—and, on the other, by dealing with the consuming apparatus, which usually involves the installation of static or rotary condensers or phase adjusters. If this is not done by the supply authority, the consumer must be induced to do it by the adoption of a suitable tariff. The subject is fully dealt with in an interesting article, commencing in this issue, by Mr. E. W. Dorey, who, in association with Mr. W. A. Hole, has acquired a considerable experience in the improvement of power factor by various methods.

Indian Water-Power Resources.

The Preliminary Report on the Water-Power Resources of India, compiled by Mr. J. W. Meares, Chief Engineer to the Hydro-Electric Survey of India, renders double service to the engineering and industrial communities of the Empire. In the first place, it sets forth what has already been done, and what it is proposed to do in future in developing the water-power resources of India; and in the second place, it provides an admirable exposition of the main facts and principles determining the possibilities and data required for the assessment of any potential hydro-electric development. The information relating specifically to India is of primary interest to Indian engineers, Indian power consumers, and British manufacturers of hydro-electric and general industrial equipment; whilst the information relating to the investigation and utilisation of water power in general is of universal applicability, and may be studied profitably by anyone interested in the water power of any country. We begin a review of the Report elsewhere in this issue.

It has long been realised that the Indian Empire has enormous water-power resources, some of which have already been developed to a limited extent in favourable localities. Hitherto, however, India has not been to any great extent an industrial country, so that interest in the development of hydro-electric resources has been confined to a few enthusiastic pioneers, and progress has been restricted appreciably by the power development schemes and industrial developments waiting on each other—the power scheme for an assured load, and the factory or workshop for a cheap power supply.

Prior to the advent of the Tata Hydro-Electric Power Supply Co., practically all the industries in British India were dependent on fuel. Mysore, however, had developed considerable power for industrial purposes from the Cauvery River, when the only pre-existing hydro-electric installation in India was the small municipal lighting installation at Darjeeling. A letter circulated by the Government of India in 1905, inquiring as to possible sites where water power might be developed, led to little definite information being collected, and it is a matter for great regret that machinery for collecting data as to the minimum flow, &c., of streams, was not instituted at that date. The Report of the Indian Industrial Commission, 1916-18, emphasised that the whole industrial future of India was dependent upon the provision of cheap power, and urged the desirability of undertaking an official hydrographic survey of the Empire. Since then no time has been lost. The late Mr. G. T. Barlow, then Chief Engineer, Irrigation Branch, United Provinces, was appointed Chief Engineer to the Hydrographic Survey, and, in association with Mr. J. W. Meares, Electrical Adviser to the Government of India, was successful in collecting an invaluable mass of material for the Report now under discussion. The complete survey must necessarily extend over a period of years, but the Preliminary Report bears evidence to the fact that there is much water power in India which can be developed forthwith. There will be keen competitors in the market, and British manufacturers of pipes, turbines, generators, and switchgear must see to it that they are not left stranded. Hitherto important orders have been allowed to go to countries which have specialised in water power, and it has even been asserted that engineers from those countries are needed to erect the plant when received. It is high time that such ridiculous fallacies were exploded. British engineers and manufacturers need take second place to none.

Pro-German Solicitations.

The outbreak of the great war once for all dispelled an illusion which we, with many others, had cherished—that Science was international, above and beyond the influence of politics, and unrestricted by national boundaries. Unfortunately, we found that German scientists took their stand in the foremost ranks of our enemies, and vied with their most virulent spokesmen in the utterance of bitter sentiments towards this country; not content with words, they prostituted their scientific knowledge to the invention of devices calculated to cause the most agonising torture, and therefore banned by all civilised nations. Thereby they brought dishonour upon the name of Science—not only their debased conception of it, but all science, in the minds of the public. Can the German chemists ever be forgiven for this reversion to methods of barbarism?

We are prompted to ask this question by the receipt of a pamphlet addressed "To the Members of the Academies of the Allied Nations and of the United States of America," signed by 177 "members of the Academies represented in the International Association of Academies," of whose names, however, hardly any are familiar to our eyes. They are drawn mainly from Holland, Denmark, Norway, Sweden, Switzerland, and Spain—the "neutral" nations. The object of the pamphlet is to bring about a reconciliation between Allied and German scientists, and it is urged that "there seems to be more room for generosity when the war's misery is past than when it is still raging; more, too, towards a defeated enemy than towards one who is still to be feared." Do the signatories really believe in the truth of these suggestions? Have they forgotten that we mourn—though with pride and thanksgiving—the loss of over one million of the best of our sons?—that we can never put out of mind the lifelong mutilation or disablement of almost as many more, or the cruelties deliberately inflicted upon our suffering Allies?

Or do they believe that Germany, beaten to her knees, is no longer to be feared?—We know better.

The declaration unanimously adopted by the Interallied Reunion of Scientific Academies in London, recording the appalling list of German breaches of the laws of civilisation as vital reasons for refusing to readmit the scientists of the Central Empires to personal relations, is quoted at length, but the authors of the pamphlet say: "It is not for us to discuss these facts"—that is left to the diplomatists! But we will not trust diplomatists to act for us on such an issue. The authors threaten us with this dread warning: "Who will be responsible if, later on, the central savants, feeling themselves insulted, refuse to reunite the bonds which you severed?"—*Feeling themselves insulted*—what insolent hardihood! They go on to refer to "the sufferings and errors of both parties," and to entreat us to "try to understand the others, your enemies of yesterday," with specious arguments for which we have not space, but which fill us with disgust.

Our answer is brief: It is not to us that you should address your exhortations, but to those others. We are ready to recognise them—on one condition: namely, that they confess the error of their ways, express their horror and detestation of the crimes committed by the German nation, and manifest sincere repentance for the past. Then, and only then, will we resume relations with the Germans.

THE IMPROVEMENT OF POWER FACTOR.

By E. W. DOREY.

When alternating-current supply was first adopted for general distribution, the power factor of the system was high, because the lighting load, which has a power factor of approximately unity, formed the major portion of the load. To-day, however, a very different state of affairs exists, in that practically all undertakings of any importance have a power load greatly in excess of the lighting load, and the high power factor of the latter has very little effect on the power factor of the total load.

Power Factor.

The current in an alternating-current circuit is composed of two components—one the energy component and the other the wattless component; the former is in phase with the E.M.F., whereas the latter is 90° out of phase with the E.M.F., and may be either leading or lagging, according as the capacity or the inductance of the circuit predominates.

In practical everyday life the lagging power factor of a system is due to the running of asynchronous or induction motors, the inherent features of which demand a magnetising current lagging 90° out of phase with the E.M.F. The total current taken by the motor, as read on the ammeter, is the vectorial sum of the wattless component and the true energy component. The power factor is the ratio of the true energy component to the total current.

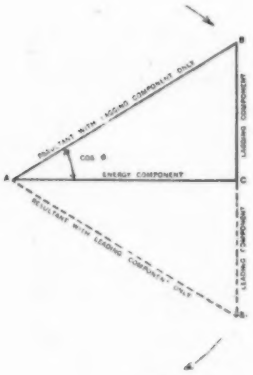

Fig. 1.

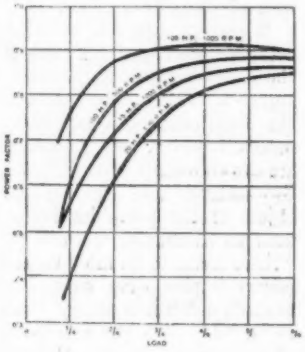

Fig. 2.

Referring to the diagram, fig. 1, the full lines indicate the conditions in a circuit with lagging power factor cos ϕ, where A C is the energy component, B C the lagging wattless component, and A B the resultant lagging current. If condenser capacity of a value B_1 C be introduced into the circuit, the lagging component B C will be neutralised, thereby raising the power factor to unity, and bringing the current into phase with the E.M.F. as A C.

Whether the power factor of a system is leading or lagging the total current is greater than would be the case at unity power factor. As in the case of almost every A.C. supply undertaking the power factor lags very considerably, it is desirable to ascertain how far the ideal of unity power factor can be approached by the installation of apparatus to improve the power factor, thereby neutralising either wholly or partly the lagging wattless current.

Composition of Load on the System.

Speaking generally, the load on a supply system is composed of traction, lighting, and general power load.

Traction load is in most cases supplied through rotary converters, and these can usually be over-excited to run at leading power factor in order to correct the lagging power factor of the system, but in the majority of cases the correction thus obtainable is quite inadequate to compensate for the lagging power factor of the general power load.

The lighting load with its power factor approaching unity assists in the improvement of power factor, particularly at times of peak load, when this takes place during the dark hours, but here again the correction is, in the majority of cases, not very appreciable.

The general power load, in the majority of cases, has the greatest influence on the power factor, and with its continued growth the power factor of many undertakings is steadily falling, with far-reaching and serious consequences. To get at the true facts it is well, first, to consider:—

1. The causes of low power factor.
2. The effects of low power factor on the supply system.
3. Whether supply undertaking or consumer should improve the power factor.
4. Methods of improving the power factor.

1. The Causes of Low Power Factor.

The continued fall in the power factor of most supply systems is the result of:—

(*a*) Installing larger motors than are required for the work they have to do, in consequence of which the motors run underloaded with a low power factor.

(*b*) The installation of motors with low power factor when motors of much higher power factor are available.

(*c*) Bad arrangement of drives in factories, &c., whereby numbers of motors run light, or very lightly loaded, for considerable periods.

(*d*) Installing a large number of small motors where one large motor could be employed without loss of overall efficiency.

(*e*) The installation of a low-speed motor where a high-speed motor would be suitable.

In each case it will be seen that the consumer's choice or use of apparatus is at the root of the trouble, and, therefore, it is the consumer who should be compelled, or induced, to install plant for the improvement of the power factor of his load.

Too much emphasis cannot be laid on the importance of installing a motor of the correct H.P. and highest practicable speed and power factor, and with regard to the last point a study of the varying power factors of different makes of motors, of the same H.P. and speed, will prove very enlightening, as a difference of 5 per cent. is quite common.

The following Tables I, II and III and curves, fig. 2, show the effect of speed and load on the power factor, and are taken from data of motors of high-class manufacture:—

TABLE I.—Power Factors of Motors at Different Speeds.

B.H.P. motor.	R.P.M. Motor. 500	750	1,000	1,500
10	0·78	0·86	0·87	0·87
30	0·84	0·865	0·88	0·89
50	0·855	0·88	0·89	0·90
100	0·885	0·89	0·90	0·915

TABLE II.—Power Factors of Low-speed Motors.

B.H.P.	R.P.M. 375	300	250	215	150	107
50	0·84	0·82	0·82	0·75	0·75	—
75	0·85	0·82	0·83	0·76	0·75	—
100	0·86	0·83	0·83	0·77	0·76	0·72
200	0·88	0·85	0·86	0·80	0·79	0·73
300	0·89	0·86	0·86	0·84	0·81	0·74
500	0·90	0·87	0·87	0·87	0·83	0·75

TABLE III.—Power Factors of Small Squirrel-Cage Motors.

B.H.P.	R.P.M. 1,500	1,000	750
5·0	0·88	0·84	0·83
3·0	0·87	0·80	0·78
1·0	0·85	0·75	0·70
0·5	0·83	0·72	—
0·3	0·80	0·68	—

2. The Effects of Low Power Factor on the Supply System.

The maximum efficiency in both generation and transmission of alternating current is obtainable when the power factor of the whole system is unity, and although it is quite

impossible in practical, everyday life to attain this result, it should be the aim of those responsible to approach this condition as nearly as is desirable from the economical standpoint. The chief disadvantages of low power factor may be summarised as follows :—

(*a*) Increased losses in generators, transformers, cables, &c. This point is well illustrated by comparing the current in a system at varying power factors but constant voltage ; *e.g.*, a 400-volt motor load taking a full-load current of 100 amperes at unity power factor would take the following currents at other power factors :—

Power factor ...	...	1·0	0·9	0·8	0·7	0·6	0·5	0·4	0·3
Current in amperes	...	100	111	125	143	167	200	250	333

It is quite usual to find loads consisting of a number of small motors operating with a power factor of 0·7 and even 0·5, but the lower figure is fortunately the exception, and not the rule.

In any A.C. system the losses vary inversely as the square of the power factor ; *e.g.*, with a power factor of 0·7 the losses would be twice those at unity power factor, and this illustrates better than anything the futility and danger of speaking of A.C. loads in terms of KW., instead of K.V.A., as so often happens. Looked at from the other standpoint, in order to keep the loss the same, it would be necessary to have twice the sectional area of cable for a load at 0·7 power factor, compared with the same load at unity power factor.

(*b*) The cost of generators, transformers, cables, switchgear, &c., is governed by the K.V.A. and not the KW. capacity ; *e.g.*, a generator and its transmission system supplying a load at a power factor of 0·7 would have to be about 40 per cent. larger than would be necessary at unity power factor.

(*c*) As the generating sets are designed for a specific power factor, it follows that if the power factor is lower the alternators cannot deal with their full KW. capacity, and thus the prime movers and boilers are unable to be loaded to a maximum owing to limitations of the alternator, and this impairs the efficiency of the prime mover.

(*d*) The voltage regulation of the whole system is seriously affected by the power factor, as, quite apart from the increase in losses in mains, the inherent regulation of both transformers and generators is very adversely affected ; *e.g.*, speaking in general terms, the regulation of large transformers is about 1 per cent. at unity power factor and 3 per cent. at 0·7 power factor, whereas the generators have a regulation of about 10 per cent. at unity and 25 per cent. at 0·7 power factor.

(*e*) The excitation losses of alternators increase as the power factor falls, and often result in overheating of the rotor and overloading of the exciter at low power factors.

(*f*) A low power factor often entails the running of additional generators and transformers ; *e.g.*, if the generating sets consist of 500-K.V.A. alternators, and the transformers in the sub-station of 250-K.V.A. units, then with a load of 500 KW. at unity power factor—*i.e.*, 500 K.V.A.—one alternator and two transformers would be required, whereas if the power factor of the load were 0·7, the K.V.A. capacity would be increased to 715, thus necessitating two alternators and three transformers in commission.

3. Whether the Supply Undertaking or the Consumer Should Improve the Power Factor.

A study of the causes of low power factor shows that it is to the consumer we must look for the improvement, and herein lies the difficulty, as, although the consumer may be compelled to install motors with high power factor at full load, the grouping of the motors and their loading—*i.e.*, their utilisation—is entirely in the hands of the consumer.

It is evident, therefore, that steps must be taken by the supply undertaking to protect itself against low power factor, and to-day many supply agreements embody a clause providing that the power factor under normal working conditions shall not fall below 80 per cent., but on the other hand, many, perhaps the majority, have no such clause. Whether the clause exists or not, the best way of touching the, not always very tender, heart of the consumer is to offer him an inducement to improve the power factor by way of a saving in £ s. d. for improvement, and a penalty for the reverse.

Futile attempts have been made by some supply undertakings to keep the power factor high by incorporating in their rules and regulations power-factor conditions which are wholly impracticable, and are therefore ignored by the consumer's engineer. Take as an example the following extract from a regulation drawn up by one of the largest metropolitan supply undertakings :—

Power Factor.

The power factor of the motor when running shall not fall below the following values :—

½ H.P. to 1 H.P. ... ... 75 per cent.
over 1 H.P. to 3 H.P. ... ... 78 per cent., &c.

Such a regulation is a hindrance and not a help to the industry in general, as it simply cannot be complied with ; for even if the very high power factor required of the ½-H.P. motor is obtainable at full load it certainly is not at ¼ load, which equally well is covered by the words "when running." By all means let us have a power-factor clause, but let it be one that is practical and not one that irritates or confuses the consumer.

The consumer must be penalised for low power factor, and given a bonus for high power factor, and this can well be done by :—

1. Adopting a tariff based on the consumption in K.V.A.-hours, or on a fixed ratio of KW.-hours to K.V.A.-hours.

2. Making a fixed charge per K.V.A. per quarter, or per annum, of maximum demand, together with a running charge per unit consumed.

Prof. Arno invented a meter which, for convenience, will be termed the Arno meter, and which is neither a true KW.-hour nor K.V.A.-hour meter, but a combination of the two, whereby the meter records two-thirds true units (KW.-hours) and one-third apparent units (K.V.A.-hours).

Assuming that the price charged is 1d. per unit (real, apparent, or on the Arno system, ⅔ plus ⅓), the revenue from a 10-K.V.A. load for one hour at 80 per cent. power factor would compare as follows :—

True unit meter, 10 K.V.A.-hours, at 0·8 power factor = 8 KW.-hours at 1d. ... ... 8d.

Arno meter, 10 K.V.A.-hours at 0·8 power factor = 8 KW.-hours.

$$\left.\begin{matrix} 8 \times 0{\cdot}66 \times 1\text{d.} \\ 10 \times 0{\cdot}33 \times 1\text{d.} \end{matrix}\right\} \quad \ldots \quad \ldots \quad 8{\cdot}66\text{d.}$$

K.V.A-hour meter, 10 K.V.A-hours at 0·8 power factor = 10 K.V.A.-hours at 1d.... ... 10d.

Revenue with Arno meter at different power factors :—

10 KW.-hr. at P.F. 1·0 = 10 K.V.A.-hr. = 10d.
10 KW.-hr. at P.F. 0·8 = 12·5 K.V.A.-hr. = 12·5d.
10 KW.-hr. at P.F. 0·6 = 16.66 K.V.A.-hr. = 16·66d.

The Arno system approximates more closely to the actual cost per unit sold than the true unit meter, and constitutes, therefore, a step in the right direction ; but being based on average power-factor conditions, it is not fundamentally sound, as the charge should vary with the varying power factor.

The Arno meter could profitably be employed by supply undertakings for the smaller consumers, where the expensive instruments necessary for Method 2 would not be warranted, as it would afford some inducement to consumers to improve the power factor.

(*To be continued.*)

The Benevolent Institution Dinner.—We have pleasure in announcing that the annual festival dinner of the Electrical Trades Benevolent Institution is to be held this year. For five years the event has had to be dispensed with, thanks to Germany. This time Mr. J. H. Cash will be in the chair; the date is Wednesday, November 12th, and the place, the Imperial Restaurant (Oddenino's), Regent Street. We join with the committee and secretary in hoping that members of the electrical industry will support the chairman with their presence, and by their contributions. If they are unable to attend the dinner they are urged to help the fund by sending contributions to a member of the committee or to Mr. Cash, whose address is Caxton House, Westminster, S.W. Mr. F. B. O. Hawes, the secretary, is now, as always, in a position of readiness to receive contributions for this very worthy and necessitous fund.

MARRIED v. SINGLE—WHICH IS THE MOST VALUABLE TO INDUSTRY?

By WILLIAM J. HISCOX.

At the present time in industry, the married man is at a discount—"On account of the house shortage, single men preferred," so many advertisements read just now. That he will come to his own again before long, cannot be doubted, but it will perhaps be interesting to speculate which, under ordinary conditions, and the qualifications being equal, is the most likely to gain the ear of the prospective employer—the bachelor or the benedict. The verdict in a majority of the cases would be in favour of the latter.

The object of this article is to set forth what, in the writer's opinion, constitute the advantages the one man has over the other, and how these are viewed by the prospective employer. For the purposes of this article, therefore, it is assumed that the married man is the father of a family, whilst the single man is entirely free from "dependents."

It will be seen from the outset that the married man has interests apart from his work, and it may be inferred that he cannot enter so wholeheartedly into his duties as can the man who does not possess these extra interests. Married life, too, brings anxieties and responsibilities, and the chances of sickness are multiplied by the number of persons constituting the family. Thus, when the single man falls sick, he lays off until he is well again, and the same remarks apply to the married man. But ofttimes the latter's wife and children fall sick, and it may be that he has to absent himself from work for this reason, or, assuming that the sickness is not so serious as to require his presence at home, it is certain that he must worry, and that as a consequence the quality of his work must suffer.

Other troubles and responsibilities come his way—a growing family is expensive, and an increasing family is more expensive still. He does not get higher wages than the single man in order to meet those expenses, for he brought them on himself. But it is a worrying business trying to make ends meet, and it must have an effect upon his work in the factory.

And the single man? He has no such worries and responsibilities, and as a consequence his mind is concentrated wholly upon business. His market value is, therefore, on a higher plane than that of his married brother, and he appears to possess advantages which should entitle him to the consideration of the employer. Everything, apparently, is in his favour, and yet, except in the peculiar circumstances prevailing at the present time, it cannot be said that the single man receives priority in the matter of employment.

The truth is that the manifold worries and responsibilities which beset the married man constitute (in the eyes of the employer) his greatest asset. He realises those responsibilities, and recognises that he must shoulder them; as a consequence, therefore, he lays himself out to discharge his obligations. He has a home, a wife and a family, and they must be maintained. He must earn sufficient for that maintenance, and, therefore, must look after his job. Efficiency nowadays is the only thing which counts in industry, and he knows that if he is to improve his lot (or even to keep his present position), he must become proficient.

His children must be educated. He himself had to be content with the ordinary elementary school education, but he is determined that his children shall have a better start than he did, and that determination is the incentive to put more into his job, with a view to gaining his object. He may ponder and scheme, and wonder where the money is coming from, but after due deliberation he realises that it must come as a result of his own endeavour; that it is upon his brain and his brawn that the future of his children depends.

He has his periods of depression, when everything seems to be going wrong; when it appears that his schemes can never materialise; and he feels that nothing is worth striving for. Then it is that his efficiency deteriorates, and it appears that his employer has made a bad bargain. But that period of depression, and its consequent bad effect upon his efficiency, is in reality nothing but relaxation, which, when it has passed, imbues the spirit with greater determination to succeed, despite the heavy odds. Thus in effect, the very worries which are looked upon as a handicap to business proficiency, are in reality the greatest aids to efficiency, for they will often force a man to rise to heights which, under more tranquil conditions, he could never attain.

The married man realises the value of his job, and what it means to him. That is not to say that he is contented with his lot, and having got a job, is constrained to hang on to it. On the contrary, he is not content, and regards his present job as a stepping stone to something higher. He does not, however, throw away one job until he has got another, and he does not seek another unless he is proficient in his present position, when he looks out for something higher.

He may be a clerk, earning £3 a week. He knows that his chief is getting £6 a week, and he considers that his wife and children are entitled to the standard of living enjoyed by the dependents of his chief. He is determined, therefore, to be a department chief, but he knows he must qualify for the position, and, as a consequence, he works with a view to first becoming efficient in his own sphere, and then endeavouring to rise beyond his present position. Left to himself, with no outside worries or responsibilities, he may be content with his present position, and thus do an injustice to himself and also to the industry. Outside responsibilities—the fact that the future of others is dependent upon one's exertions—provide an incentive which is of the utmost value to the individual concerned, to the employer, and to industry generally.

It must not be assumed that it is impossible for the single man to lay himself out for advancement, for obviously ambition is primarily for the young. It may be that certain men, both of the single and married varieties, are possessed of temperaments or dispositions which demand ease and contentment, and who, when they get hold of a job which suits them, are quite satisfied with their lot. When this is the case, however, it becomes speedily apparent that the married man suffers by comparison, and however distasteful it may be to him personally, force of circumstances compels him to make an effort to improve his lot.

The ambitious young man, intent upon securing a good position, is regardless of anything other than the object he has in view. He uses one position merely to climb to one higher, and his work is of a quality just high enough to justify promotion. He is proficient because he cannot help it, but his work does not contain the substance which characterises the work of the man to whom his job is more than a passing interest. Incentive is a wonderful thing, transforming as it does a mediocrity into a genius. The great advances made in science and industry during recent years are the direct results of disappointments and adversity, and knowing this, it is small wonder that the employer prefers the man who, on account of his outside interests and responsibilities, simply cannot afford to do other than achieve success.

Let us make no mistake. Despite standardisation and sectionalisation, individualism is a telling factor, and cannot be obviated. Industry depends first upon the individual, and then upon that individual's collective prowess. The worker does not destroy his individual initiative and ability by becoming amenable to the factory system, but merely subdues it, although ostensibly one of the crowd, he nevertheless is an outstanding figure, doing his duty, but ever ready to rise to what the occasion may offer.

There are, of course, extremes in every phase of life, and it must not be inferred that trouble and disappointment are necessary to produce the efficient worker. On the contrary, adversity will in many instances have a detrimental effect upon efficiency, and in the interests of industry therefore, the workers' lot should be on such a plane as to preclude the aggravation of any domestic responsibility. Although at the moment the worker is not in the position which will provide the standard of living he has the right to expect, he should know that that standard is attainable, and that the opportunity is his if he will only seize it.

The employer looks after his own interests, and he naturally selects the man from whom he may reasonably

expect the best results. It is the unscrupulous employer who trades upon domestic affliction to obtain the services of a man at less than his market value, and this individual, it is pleasing to note, is gradually being taught the error of his ways. The employment of a man is a business proposition, and also a risky one, for much has to be taken for granted. Generally speaking, however, the preference is given to the married man because, in the employer's eyes, he is the better speculation, and possesses more possibilities than his unmarried brother.

ABOUT GAS.

By E. AUSTIN.

Gas is an aeriform fluid which reaches its destination by way of pipes, and is supplied to the misguided public for lighting, heating, and cooking, incidentally asphyxiating people, and causing explosions. Gas, we are told, is the fuel of the future, because the gas works supply to the community some 70 to 80 per cent. of the total heat value of the coal delivered to them, as compared with less than 20 per cent. promised by the advocates of super-electric generating stations. Gas is also alleged to reduce household drudgery to a minimum, to avoid the pollution of the air and the darkening of the skies by smoke. These are the things the people of this country are being told. The newspapers contain advertisements setting forth the virtues of gas, and, unfortunately, they are read. The people are told that the generation of electricity wastes coal, that gas is cheap and clean; and we electrical folk, with something infinitely better to offer, are more or less silent. Does gas blacken ceilings and spoil decorative work? The advertisements do not say anything about that, possibly because it is assumed that it is already a familiar fact. They do not state that when gas is used for heating most of the heat goes up the chimney, or that when gas is used in an engine only a small proportion of the heat value of the gas manifests itself in the form of mechanical power. The people are told none of these things. What they are told is that gas is the fuel of the future because some 70 to 80 per cent. of the total heat value of the fuel is supplied to the consumers. How much of the heat is lost when it comes to using the gas, the consumers are left to discover for themselves.

What are we electrical people going to do? Are we going to let these gas merchants continue their mischievous propaganda and gull the public into believing that electricity has no place in the universe? It is no use persuading ourselves that because electricity is infinitely superior to gas, we can afford to ignore the activities of these pests. The daily papers are powerful. They have enormous circulations, and this perpetual talk about gas and its advantages cannot have anything but a harmful effect upon the electrical industry. Periodically we allow the populace of this country to be told that the generation of electricity wastes the nation's coal, and, instead of maintaining that by utilising the waste heat from blast furnaces, &c., we can generate a fair amount of electricity without using any additional coal at all, we permit this nonsensical chatter to continue without contradiction. The people are told to use gas, and they do so, just as they take Ceecham's Pills and use Moonlight Soap. This idiotic state of affairs must not continue. We must tell the public the truth about electricity, and to do that we must gain access to the columns of the daily papers. We must advertise. If we cannot find the money we must borrow some, and if we are compelled to pay it back, we can easily do so when we have taught the people to realise what a wondrous and glorious thing electricity is. They must be taught to understand that electricity will light and heat their homes infinitely better than gas, and without all its annoyances. They must be told that it will wash, mangle, and iron the clothes, cook the dinner, wash the dishes, make the toast, clean the carpets, knives, forks, and boots, drive the sewing machine, grind the coffee, chop the meat, boil the water, heat the glue pot, play the piano, and work the gramophone, milk the cow, cut the grass, hatch the chicks, propel the motor-car, plough the land, and perform innumerable other operations with the greatest of ease. When we have explained all this—when we have demonstrated beyond all doubt that electricity is indispensable to those who desire to live in comfort—we shall have accomplished a great and important task. We shall have made life worth living, and in the process we shall exterminate once and for all this dangerous and terrible substance, gas.

THIRD HARMONICS IN GENERATOR WINDINGS.

By L. C. GRANT.

The third harmonic is the most troublesome of all harmonic voltages, and is present in practically all generator windings. Unless steps are taken to deal with it from the commencement, it is likely to give a great deal of trouble to those having to deal with the working of electrical plant.

The harmonic frequency may be such that it runs in opposition, or, on the other hand, it may run in phase, with the power waves. In the former case, the respective voltages coincide at their peak values, giving to the power wave a peak formation; when, however, the waves are in phase, the peaks do not coincide, and the power wave is altered in an entirely different manner. This results in a flattened formation, with a dip instead of a peak, but broadens out the wave considerably. Should the harmonic be entirely out of phase—not out of step, of course—it merely results in a complicated wave form, in which the two halves of the cycle are dissimilar.

With a polyphase generator, the phase couplings have an important bearing on the harmonic voltages. Should the machine be coupled in mesh, a difference in potential will exist at various points of the mesh, which should normally be at similar potential; this results in circulating currents flowing through the windings which will dissipate the harmonic, but in a questionable manner.

Now, if we connect the phases in star, the line voltage will be the sum of two phase voltages displaced by 60°. The result of this phase displacement is that all harmonic frequencies are displaced by a like amount. For the third harmonic, this means that the frequencies are displaced in each phase by half a cycle, resulting in their cancelling one another through being in opposition. Obviously, the same holds good with any other harmonic frequencies which are a multiple of three. Thus, as far as the line is concerned, the third harmonic is wiped out. It must be borne in mind, however, that the harmonic frequencies still exist between any phase and the neutral point of the star.

With generators operating in parallel, it is usually necessary to earth the neutral point, to limit and define the voltage to earth, and also to allow the fault-protective gear to operate. It is also essential that more than one generator neutral be earthed if absolute reliability is to be depended upon, as in case of a generator failure, should only one neutral be earthed, and this machine be the one to fail, the supply system will then be minus a neutral, and trip gear, &c., will be rendered useless.

On the other hand, should we run with more than one neutral connected to earth, we then have the phases paralleled *via* the neutral points and earth, and the harmonic voltages again exist, and may assume extremely dangerous proportions. In consequence, it becomes necessary to earth *via* some current-limiting device such as a resistance or reactance; a reactance is advantageous in that it has a much greater impedance for third and any other harmonics than for the power frequency.

In any case, circulating currents of greater or less magnitude will be set up unless the harmonic voltages happen to coincide exactly at all points and all times, and this, of course, is too much to expect, even with the best of machines with varying loads, irregularities of material, &c. These circulating currents may very easily reach a high value, and

can be up to the full-load current of the machine, hence the value of the neutral resistance or similar device.

On account of the modern generator now being of purposely high reactance in itself, third and other harmonic trouble is not now so pronounced as it was some years back, when the main feature in generator design was good regulation, and consequently low reactance in the windings.

As previously pointed out, this reactance opposes a considerably higher impedance to harmonic frequencies than to the power frequency, and thus, in some cases, we find it quite feasible to parallel two generator neutrals directly without the use of external current-limiting devices.

In earthing generator neutrals, it is always advisable to use a fairly heavy oil switch, and to include an ammeter in the circuit, as with the two machines it is not possible to gauge even approximately the earth current by comparison with machine and feeder readings, owing to the wide variation that may exist in the load and earth components.

BRUSH SELECTION FOR ELECTRICAL MACHINERY.

By FREDERICK MURGATROYD, B.Sc. (Tech.).

Multiplicity of Grades.—The ideal of many engineers is to reduce the available number of grades of carbon brushes to three, or two, or even one—their eyes are directed, that is, towards a "universal brush." And while their vision is thus convergent, that of the brush manufacturer is apparently divergent, for leading firms are constantly adding to their standard grades, or replacing old standards by new ones. There is, of course, an economic limit to the number of grades to complete an ideal schedule, but this is nearer 20 than 1 for this reason, that brushes have to be made to suit all sorts of electrical and mechanical conditions. The "universal brush" could only be possible by taking it as the starting point in design, and bringing all commutators and slip-rings into line to suit it, which procedure would be very absurd.

The ideal, therefore, is to reduce the various qualities of brush to such as are found in practice necessary. We must then look upon this minimum not as an infliction, but as the only means whereby economic and scientific design of commutators and slip-rings is made possible.

The Choosing of Grades.—It is proposed in this article to give some guide as to the best grade for each class of service. The qualities given are not based on a study of makers' catalogues, but have been found to be best through some years' specialisation in this subject. The scheme detailed must be taken only as a basis, however. Exceptions are bound to occur. For instance, one motor in a batch may give trouble, and a grade which by all the rules is the wrong one for that particular class of machine may be found the only one which will operate well. Such are, of course, freak cases, and they are sure to arise; but we are not considering now the exceptional case, but the general one.

The Available Grades.—Every manufacturer has a particular name or number designating each grade; but we shall have to leave these alone. Whatever its mark, a brush can usually be placed in one of the following classes:—

Class 1, pure graphite.
Class 2, graphite-carbon.
Class 3, carbon.
Class 4, electro-graphitic.
Class 5, metal-graphite.

There are thus five main classes, and it is a good plan for an engineer to obtain at least one sample from each class, so as to form a physical conception of the range of grades. Now, there may be two, three, or even more, grades in each class. The chief object of this, except in the case of metal-graphite brushes, has been to vary physical properties, such as hardness, abrasiveness, and lubrication, in order to suit varying mechanical conditions. But this has been overdone in the past, and a machine maker should, at any rate, try to manage with only one quality out of each class. He will probably find these too few, but it is certainly the goal to aim at.

The following will probably be useful to those who are not familiar with the various types of brush:—

Class 1.—These are brushes made from pure plumbago as it comes from the mine. The plumbago is crushed into a fine powder, and the powder is then pressed into blocks or brushes. The blocks are generally kilned.

Class 2.—Graphite-carbon brushes are composed of pure graphite, retort carbon, and lampblack in varying proportions. By this means we get a hard carbon brush, robust, but possessing lubricating properties.

Class 3.—Carbon brushes are made from retort carbon and lampblack in varying proportions. They are generally the cheapest class. They are hard, dense, and slightly abrasive, and thus are more suitable for flush mica than recessed mica.

Class 4.—Electro-graphitic brushes are substantially brushes of Class 3, which, in addition, have been raised to a very high temperature in the electric furnace, and thus rendered graphitic. By this means we obtain a brush which retains the hard, dense, and pure characteristics of carbon brushes, and combines with these a highly-lubricating nature. Moreover, electro-graphitic brushes are better commutating brushes than the ordinary carbon ones.

Class 5.—Metal-graphite brushes are composed of copper and pure graphite, together with another metal, generally tin, though in some cases the latter is omitted. These brushes become necessary to cope with very high current densities or where low brush loss is important, as on slip rings or low-voltage generators. They are difficult to manufacture, but some excellent grades in this class, of thoroughly homogeneous structure, are now on the market.

A Practical Guide in Selection.—When engaged in brush selection, to pick up a maker's schedule and to try to remember which machine or machines each grade is adapted for, is liable to lead to confusion. A better plan is to think first of the various types of machines, and allot the best grade suitable for each. That is the method we have adopted in the following table:—

Machine.	Rings or comm.	Mica.	Class of brush.	Remarks.
Rotary Converter.	Comm.	M.R.	Class 1	Class 1 brushes with M.R. have proved vastly superior to anything else.
Rotary Converter.	Rings.	—	Class 1 or 5	Preferably Class 1, if no overheating of rings results.
Turbo-Alternator.	Rings.	—	Class 1	Especially good on steel excitation rings.
D.C. Generator	Comm.	M.F. M.R.	Class 1, 2, 3, or 4	Class 1 with M.R. where current density is high. Class 2 with M.R. is the most common combination. Class 3 with M.F. where current density is low. If latter is high, and mica not obstinate, Class 2 may be used. Class 4 with either M.F. or M.R. where conditions are severe.
Low-Voltage D.C. Generator.	Comm.	M.R.	Class 5	Class 5 brushes are generally necessary below about 15 volts.
D.C. Motor ...	Comm.	M.F.	Class 3	This is general where current density allows.
Induction Motor.	Rings.	M.R. —	Class 2 Class 1, 4, or 5	Class 1 advisable provided no over-heating results. Class 5 largely used. Class 4 sometimes used, especially where brushes are lifted after starting.
D.C. Tramway Motor.	Comm.	M.F. M.R.	Class 3 Class 4	M.F. with Class 3 brushes is a popular combination.
D.C. Railway Motor. A.C. Railway Motor.	Comm. Comm.	M.R. M.R.	Class 4 Class 4	This combination is becoming standard.

M.F. = mica flush. M.R. = mica recessed.

The table reveals the fact that Class 1 brushes are the most *adaptable* as a result of experience. This is due to the increased care now given to maintenance, and to the spread of the practice of recessing the mica. It also seems to indicate that the cost of producing a good commutator surface with well recessed mica, thus allowing the use of Class 1 brushes, is more than counterbalanced by the reduced cost of maintenance in lengthening the life of both commutator and brush.

LET THE MASK BE REMOVED!

It is quite an easy matter to cry off with the mask when the representatives of manufacturers of foreign origin, not German or Austro-Hungarian, or foreign merchants or agents, who have become naturalised Englishmen, endeavour to push their goods in British markets. But, in face of the assurances which are, or will be, invariably given, it is exceedingly difficult to penetrate the mask when no precisely accurate information is in the possession of intending purchasers, or is available for their consultation. We are led to these reflections by a lengthy article published in a French contemporary, which discusses the question of raising a barrier against the invasion of German goods. In the particular case under consideration it appears that three naturalised Frenchmen, who are the sons of Germans, possessed a double existence in France before the war. On the one hand, they owned and published an export journal, ostensibly destined to promote the interests of French manufacturers and exporters. On the other, the same individuals were conducting an agency business in a variety of goods, and actually represented over 30 German and Austrian firms! Now that the war is over these persons are endeavouring to resume their activity in both of the directions indicated, although it is quite impossible to reconcile the interests of an export journal professedly issued for the benefit of French manufacturers and exporters, with a business solely intended for the importation of German and Austrian goods. We leave the question, however, with our French contemporary, which is exceedingly vigorous in its denunciation of this dual procedure, to say the least.

The subject of sincerity and straightforwardness also concerns us in Great Britain, particularly in the electrical industry and trade. We know, only too well, who are German firms in Germany, and Austrian firms in Austria; we also know, or rather knew, who were their representatives in this country. But were we aware, or fully aware, of the ramifications and connections in some form or other of the German electrical manufacturing companies in the European countries which maintained their neutrality throughout the whole period over which hostilities extended? It is to be feared that for the most part we have remained in ignorance of the part played by some firms in neutral countries in endeavouring to promote German electrical interests during the war. At the same time it is only fair to state to their credit that all neutral firms were not tarred with the German brush; and in one country in particular two important engineering firms candidly refused to adopt the suggestions made by German electrical firms that they should act for the latter in transmarine countries during the war. It is stated that the Black Lists have been withdrawn, but with Miss D.O.R.A. still smiling upon us, the present is not the time to refer to the extraordinary and unprecedented devices to which the Germans resorted in order, if possible, to maintain transmarine connections and keep their trade afloat during the course of hostilities; and when the lady receives a decent and expensive funeral, many incidents bearing upon these devices will have passed into oblivion, and therefore be lost to posterity.

It is possible, however, to say one thing in connection with the subject of German export trade from Germany, through neutral countries or so-called neutral firms in neutral countries. This is, that a mass of useful information has been collected in this country which establishes beyond a shadow of a doubt the national or international constitution, as the case may be, or the interconnection of neutrals with Germans, of all the leading manufacturing and exporting firms in practically every country throughout the world. The question arises as to whether this information, the accuracy of which is unimpeachable, is, or is not, to be utilised for the benefit of British home industries, and for that of the trading community where primarily interested. The time for action is now or never. If the information is rendered available to the trades concerned, it can do no injury to non-German interests, and it may possibly spare us the pain of learning at some future date that we have been purchasing semi-manufactures or completely finished products of German origin, or the result of German finance in other countries. It should be possible for the Board of Trade, whose leading officials, for reasons unnecessary to mention, must be cognisant of the existence of the information referred to, to obtain possession and utilise the facts for the general welfare of the country.

THE WATER-POWER RESOURCES OF INDIA.

The preliminary report of Mr. J. W. Meares, chief engineer to the Hydroelectric Survey of India, on the Water-power Resources of India* comprises a review of accomplishments and proposals, together with notes on the location and assessing of potential hydroelectric developments.

Basic Information.

Amongst the new interests awakened by the events of recent years that of developing water power in all parts of the Empire is by no means the least, and one of the salient facts brought out by Mr. Meares's report is the importance of commencing at once to collect information concerning every stream which may possibly be developed for power purposes. The records of a single year, even though it be an exceptionally dry one, form an unsafe basis for development work, and it is within the powers of almost anyone, with little or no technical knowledge, to collect simple but essential data which will save much time and greatly reduce risks when the time comes for serious investigations of the possibilities of a stream. No Briton resident in imperfectly known parts of the Empire should neglect to collect leading particulars concerning every river in his district. Sooner or later such information will prove invaluable, not because it is difficult or tedious to collect, but because the observations (very simple in themselves) necessarily extend over a period of years. The general scope of the information required is outlined in the following paragraphs, and every one able to assist in this matter should certainly study the report itself. The latter shows clearly the handicap imposed by lack of basic information, and also shows clearly how that handicap may be removed.

Classes of Water Power.

The most obvious and spectacular instance of water power is the great natural fall, such as Niagara or Cauvery, and most of the world's water-power is now obtained from natural falls or from "artificial" falls, the latter being obtained by diverting the flow of a stream in such a manner as to concentrate the accumulated head at a convenient place. There are, however, other classes of water-power developments.

Reservoir projects depend upon storing water at the top of the fall, usually by building a dam across a valley. The best example of this type of project is the Tata Co.'s installation in the Western Ghats, which is operated entirely from water stored during the monsoons, and is regulated to give the necessary flow to the turbines through a fall of some 1,750 ft. A likely area for other projects of this nature is the

* Superintendent of Government Printing, Calcutta; price Rs. 3.2, or 4s. 9d. Obtainable from usual British agents.

Cherrapunji plateau in the Khasia Hills, where there is an enormous rainfall over a small area of ground at an elevation 1,500 ft. above the adjoining plains. The difficulty there is that high dams would be required for large storage capacity, and the prevalence of earthquakes makes gravity dams unsafe. Possibly ferro-concrete dams could be used successfully. Another difficulty, common to many reservoir projects, is that of disposing safely of surplus water during wet weather. In the Khasia Hills the rainfall is sometimes 35 in. in a single day, or nearly two million tons per sq. mile of catchment.

Enormous storage volume is required if high power is to be developed from a reservoir alone, even on a high head, and a simple reservoir project is impracticable on a low head. Storage on a moderate or even on a small scale may, however, be invaluable as an adjunct to a perennial stream.

Combined irrigation and power projects have attracted spasmodic attention in India for many years past. So many factors are involved that each case must be considered on its merits, but in general the main disadvantage is the discontinuity with which irrigation canals are operated owing to the variable requirements of irrigation and the necessity for closing canals periodically for cleaning, &c. It is not always possible to develop power for industrial purposes from an irrigation system without auxiliary steam or oil plant, which may make the total cost excessive. Where large reservoirs are involved, there are better prospects for the combination of power and irrigation projects.

A class of water power which appeals much to the layman (and to many inventors) but which can rarely be developed at reasonable capital expenditure, is that in which there is a small and fluctuating rise and fall in the water. A vast amount of power is going to waste in tides and slow-moving rivers of the plains, but in very few cases can it be developed commercially so long as the competition of fuel has to be met.

Two simple rules of universal applicability may be formulated. The first is that, in the absence of a definite and ever-present fall of at least several feet, no water-power scheme is likely to mature as a commercial success. The second is that any site is worth considering where the product of the minimum discharge in cubic feet per second, multiplied by the height of the fall in feet, is not less than 16,000. Anything less than this is too small for industrial purposes, though it may be of use for lighting supply.

Weather and Water.

India differs in certain important respects from most countries whose water-power resources are now being considered, for the rainfall is seasonal. Generally speaking, there is the monsoon period and the dry period, but in the south there are two distinct monsoons, viz., the south-west and the north-east. Variations in rainfall in different parts of the country are enormous, and there are wide departures from the monthly and annual normals in any given locality. Owing to these conditions much water power necessarily goes to waste, and the flow of many streams is greatly reduced during the dry season, so that monsoon storage is the only means of developing continuous power. Discontinuous power is only of value in particular cases, such as industries which are only manufacturing during the rainy season (*e.g.*, the tea industry) or in conjunction with reserve plant using coal or other fuel.

The "run-off" from any catchment area is naturally lower than the rainfall received, and a table of percentage run-off, compiled by the late Mr. Barlow, is given in the report; even with heavy rainfall and steep, rocky catchment area, the run-off is only about 70 per cent. In India, the rainfall in different localities varies from 450 inches to a few inches, mostly precipitated in about four months, and the catchment areas range from waste sand to steep, rocky country. Snowfall on mountains provides more or less effective natural storage; to a certain extent, level marshy ground has an equalising effect, acting as a sponge, and this property may sometimes be reproduced artificially by a series of low embankments and terraces.

Stream Flow and Surveys.

Observations over a period of about 30 years are required to ascertain definitely the minimum flow of a stream, but a knowledge of the minimum flow in a single year is of considerable value, especially in conjunction with rainfall records for the district and an estimate of the average run-off. The method of measuring stream discharge is familiar to the skilled observer, but even non-technical persons may render invaluable help by estimating the flow of streams in out-of-the-way places, using the formula: Flow, in cu. ft. per sec. = surface velocity (ft. per sec.) × width of stream (ft.) × mean depth (ft.) ÷ 2. The surface velocity is determined by timing a stick floating in mid-stream, down a measured length of stream; and the mean depth is determined by taking the average of a number of soundings. The dividing factor 2 is an empirical factor allowing for the roughness of the bed; it gives conservative values for the flow in most small and medium streams.

Aneroid surveys of possible new sites for water power can be conducted with reasonable accuracy without special training. Finally, a study of large-scale contour maps, where these are available, is of great assistance in all reconnaissance work, the map indicating the general nature of the country, the catchment areas available, the probable best route for pipe lines or open channels, possible sites for reservoirs, and the possibility of obtaining a high fall economically by a tunnel piercing a watershed or a pipe-line diverting water across a hairpin bend in a river.

(To be continued.)

A SUGGESTED BRITISH EMPIRE PATENT LAW.

The following is a report of the Committee which was appointed by the Council of the Institution of Electrical Engineers to consider the amendment of the British patent law. The report, which is signed by Mr. W. M. Mordey, chairman, was adopted by the Council on July 14th last.

Numerous schemes for enabling patent protection to be secured expeditiously and at a reasonable cost in the whole or in certain parts of the British Empire by means of a single patent have been proposed from time to time, but most of these, though at first sight apparently sound and likely to be beneficial, have the serious practical drawback that to make them effective would involve radical changes in the existing Statute Laws of the different parts of the Empire.

The scheme outlined in this report aims at carrying out what should be the main objects of any Empire Patent Law, viz.:

(1) Low cost,
(2) Ease of application throughout the Empire,
(3) Reciprocity,
(4) No change involved in the existing laws of the Empire,
(5) Adherence to the scheme optional by any Dominion.

Under this scheme any person may obtain an Empire patent covering as many of the British Dominions, Colonies, Dependencies and Protectorates, collectively referred to in this report, for convenience, as territories, as he may select, by making application to the British Patent Office. The fees payable will be the sum of the existing local Government fees in the selected territories, *plus* such small fee as may be charged by the British Patent Office to cover the expense of carrying out its part of the scheme. The application will be examined and the patent granted in the same way as is an application for a British patent, and the specification when printed will bear the names of the selected territories in which it is effective. Thereafter the patent will be assimilated with the domestic patents in each of the selected territories and will be subject to the local laws in such territories for the determination of validity, infringement and all other questions affecting letters patent after grant.

Careful consideration has been given to the suggestion that a patent should be obtainable covering the whole of the British Empire in the same way that a patent in the United States covers all the States in the Union, but there are so many difficulties connected with such a scheme that it is not felt any practical result can be expected of any attempt to elaborate a proposal along such lines. It is believed that the present scheme is practical and has the merit that it can easily and immediately be put into operation without disturbing the existing laws in the various territories in the Empire.

It is assumed that usually an inventor will apply for a patent first in that part of the Empire in which he is domiciled or has his business or manufacturing establishment, in order to secure without delay protection for his invention, and it is not proposed that the existing Patents Acts or Ordinances in the various parts of the Empire should in any way be disturbed. (This, however, does not mean that the Governments of the various Dominions, &c., should not be urged to amend their laws so that they may all be made as uniform as possible in at least their principal provisions.)

The scheme proposes that in each Territory a short Act or Ordinance should be passed to the effect that any Empire patent which has been made applicable to such territory shall be received and treated by it in all respects as though such patent were a patent which had been granted under the territorial Patent Law. This is important, for otherwise there would exist two classes of patents, and difficulties might arise in interpreting them in the courts and elsewhere. The fact that the form of the specification and claims of the Empire patent might differ somewhat from that of the domestic patent should not give rise to any practical difficulties.

It is obvious that such an Empire patent as is proposed, in order to secure uniformity, which is essential, must be issued from one centre, and that centre it is suggested should be the British Patent Office.

It is recommended that the Empire patent should be applied for and issued in the same way as a British patent. Where a British patent has been applied for or obtained, the Empire patent will be a duplicate of it.

An applicant residing in any part of the British Empire may apply for a patent either in his own Dominion (being a Dominion granting a patent) or in any other part of the Empire granting a patent, and shall have a sufficient period—18 months is suggested—from the date of his first application in any part of the Empire in which to apply for an Empire patent. An Empire patent if applied for within such period shall have a priority date as of the date of application for the corresponding patent first filed in any part of the Empire.

This provision should not give rise to any difficulties, as the practice would follow that of applications for patents under the International Convention, which gives a period of one year within which applications may be filed in any of the countries belonging to the Convention.

To carry out the scheme it would be desirable to establish an Empire Patent Department of the Patent Office in London, in which all applications for Empire patents would be filed and the appropriate fees paid in respect of the selected parts of the Empire. To this department would also be paid at the appropriate times such renewal fees as may be necessary for keeping the Empire patent in force in such parts of the Empire as the patentee desired to maintain the patent. The Empire Patent Department would transmit through the appropriate channels the fees received and due to each of the Dominions, &c., in respect of the Empire patents issued and also the renewal fees, if any, paid on such patents to keep them in force.

It is urged that whilst it would be highly desirable for all parts of the Empire to adhere to this scheme for an Empire patent from the outset, it is not necessary that the adoption of the scheme should be delayed until this has been achieved. Valuable progress would result if certain parts only of the Empire decided to adopt it at first and power were given to other parts of the Empire to adhere to the scheme at a later date.

It is strongly recommended that the Empire patent should rest on its own foundation in each part of the Empire. This naturally follows from the suggestion that the Empire patent should be assimilated with the domestic patents in the various parts of the Empire, and read and interpreted in accordance with the law and practice obtaining in each part of the Empire. If, for example, in an infringement or revocation action or like proceeding in the United Kingdom or in any Dominion, the patent were declared invalid, this should not affect its validity in another Dominion in which the validity of the patent was not attacked or in which such an attack failed owing to the circumstances being different. These are substantially the conditions which obtain at present in respect of the separate patents issued by the various Dominions.

As to the fees payable in respect of the Empire patent, it would be very desirable for the various Dominions to agree on a scale of reasonable fees to be payable on application for a patent and at uniform times for the renewal of the same during its term. It is realised that the fees payable at present in respect of both these conditions vary considerably in the different Dominions, in some of them being very reasonable and in others inordinately high, and that the amount of fees payable do not in some cases correspond in amount with the extent of the territory covered or the volume of the trade in a patented article which may reasonably be expected to be done in connection therewith. However, for the same reasons that the establishment of an Empire patent has been advocated along the lines contained in this report, and in order that objections to the early commencement of the scheme may not be raised by the various parts of the Empire on the ground of loss of revenue, it is suggested that the fees payable in any of the Empire Territories should remain as they are at present. It is believed, however, that the reduction in fees which is recommended would be more than made up in the total amount received by the greatly increased number of patents applied for in the various Dominions under the present scheme.

It might be suggested that if the fees in the various Dominions are not reduced no great reduction in the cost of protecting an invention by patent in the Empire under this scheme would result. This, however, is not so, as the cost at present is not so much due to the Government fees payable as to the expenditure necessary in preparing, filing, and prosecuting an application for a patent separately in each of the Dominions.

NATIONALISATION.*

By Sir HUGH BELL.

The last subject which I desire to consider with you is the widespread tendency towards what is somewhat vaguely called nationalisation. It may be questioned whether any large number of people have very clear ideas what is meant by the term.

Let us assume for the present purpose that it signifies that the State shall become the owner of any enterprise which is nationalised—as it owns the business—the Post Office, the telegraphs and the telephones. Let us ask what advantage will be gained by the assumption of ownership. A centralised management, even of so simple a business as that of collecting and distributing letters and parcels, has not been an unqualified success. Where the business is more complicated, as in the other examples, the success has been even less conspicuous. What reason have we to hope, then, in such intricate matters as the railways or the mines, better results will follow?

The incentive of individual gain will have disappeared, and with it the readiness to accept such risks as those to which reference has already been made. We may easily find that the developments needed to find employment for our young people is not forthcoming, for without such risks being taken, no growth of employment will take place. Unless I am much mistaken, a great temptation will be put before politicians to make concessions to the huge army of voters who will be in the direct employment of the Government. The experience of these five years has failed to teach the lesson that you cannot touch one branch of labour without affecting all others.

A cure will speedily come, but it may come after great suffering has been inflicted on the whole community. Parliament can easily impose on the employer, whether a private individual or the State, the payment of a certain wage if a man is employed, but one thing it cannot do, and that is, compel the employment of the man at a wage which the price of the article he produces will not suffice to pay. The man will remain unemployed. That is the drastic remedy which economic law imposes.

The hope that transferring ownership to the State from the individual will enable us to pay more is foredoomed to disappointment. There is, indeed, one—and only one—way in which higher wages can be obtained. That is by a greater product per unit of capital and per unit of wage. If an article now produced at a combined capital and labour cost of, say, 100, can by improved methods be produced at, say, 80, and still sold for 100, and if capital is still satisfied with its former share, then the whole of the extra 20 will come to labour. Long experience teaches me that it is in this way that wages have advanced in the past, and that in this way alone can they be further increased in the future.

But it may be said that those most concerned are not striving alone, or even chiefly, for higher wages, but desire to participate in the management and to bear their part in deciding the questions of policy which up to now have been in the hands of the employers. To this no fundamental objection can be raised. The more completely the men engaged in any enterprise understand it the better it will probably be for the whole. But large questions of policy require knowledge and appreciation of circumstances which can with difficulty be acquired by persons whose life is necessarily passed in quite other surroundings. That the fullest information should be given to the persons in question cannot be denied. The claim to deal with matters of management lying quite beyond their competence cannot be conceded. The final impulse comes from one mind which cannot divest itself of its responsibility, nor exercise it under such conditions as those suggested would impose.

*Extract from Presidential Address to the Economic Science Section of the British Association.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Moore's Direct-reading Anemometer.

Among the exhibits on view at Sir Napier Shaw's "At Home" to overseas meteorologists, at the Meteorological Conference on September 22nd, was the inventor's model of Moore's direct-reading anemometer (Patent No. 129,503). This device works on the principle of the "electric tachometer," a megneto-generator being actuated by a propulsive system responsive to air movements—a delicate D.C. voltmeter, calibrated in M.P.H. (or the like), measuring the actual speed. The inventor's model, figs. 1 and 2, is of the pattern intended for meteorologists. In order to reduce inertia to a minimum and yet retain the magnetic flux in the polar space at a consistent maximum, the armature is made in a hollow form, and it rotates around a fixed core of iron. The top end of the armature is attached to a vertical shaft bearing the well-known Robinson-cup arrangement, whilst the lower end carries a light commutator and is supported by a ball-bearing on the stem which sustains the fixed core. Suitably light brushes rub against the commutator. The induced voltage is measured by what is essentially a milli-voltmeter, the latter, however, being scaled off in miles-per-hour, this having been effected in a wind tunnel at the National Physical Laboratory. The indicator may repose inside the case of the anemometer, or it may be installed at a distance.

The theory of the apparatus is not so simple as that of the

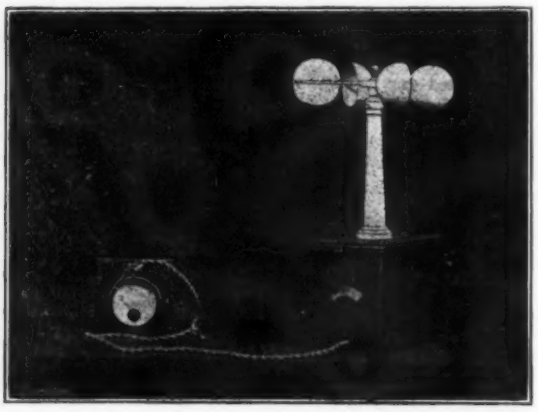

Fig. 1.—Moore's Direct-reading Anemometer and Wind-speed Indicator.

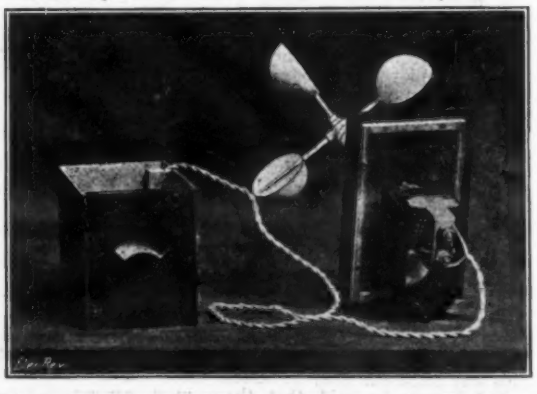

Fig. 2.—Showing the Magneto Generator; the Indicator being inside the case.

co-called electric speed-indicator, mainly owing to the fact that a certain erratic slippage occurs between the Robinson-cup arrangement and air movements; at low wind speeds the former moves at a speed slightly under one-third that of the air, but at high velocities it exceeds that ratio. In many existing anemometers this behaviour necessitates percentage corrections to given results, but in Moore's pattern such relative inconsistency affects the induced voltage and hence becomes automatically allowed for in the scaling of the indicator.

A New Motor Car Lighting System.

With the standard Ford system of motor-car electric lighting the disadvantages of the lowering of head lights when slowing down the car speed are inevitable, but a conversion set is about to appear on the market which will eliminate this drawback of the system.

According to the *Motor*, the producer of this device is the Universal Car Engineering Co., 52, Lincoln's Inn, Corporation Street, Birmingham. Briefly the "U.C." lighting system may be described as one which, by means of an engine-driven rectifier, converts the A.C. generated by the Ford magneto to D.C. suitable for charging accumulators, which in turn supply the lamps. The rectifier, of simple construction, consists of a metal case carrying a rotary rectifying switch having in conjunction with it a slip ring, built up on a mild steel shaft which rotates on Hoffmann ball bearings; one end of the shaft projects from the case and carries a hardened steel chain sprocket by which the rectifier is driven. A moulded box attached to the top of the casing houses the necessary brushes and terminals. The rectifying switch itself is built up of two sets of copper bars insulated from each other and clamped together on a hub by means of insulated steel vee rings in a similar manner to an ordinary commutator. Between each pair of live bars is placed a dummy or spacing bar, insulated by mica segments. One set of live bars is permanently connected to a slip ring which is in turn electrically connected to the magneto through a brush. The other set of live bars is connected to a ring which is earthed. Five carbon brushes are carried in the moulded brush box, one of which makes contact with the slip ring and is connected to the magneto. The remaining four constitute the D.C. brushes and are divided into pairs, so arranged that when one set is in contact with the bars connected to the slip ring, the other set is in contact with the bars connected to

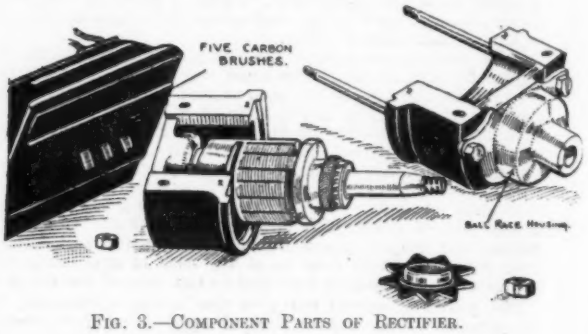

Fig. 3.—Component Parts of Rectifier.

the frame. The whole is so arranged that when the switch is rotated the position of the bars underneath is reversed with the reversal of the current from the magneto, thus giving D.C. at this set of brushes.

In order automatically to switch the battery into circuit with the rectifier when the engine starts, and to switch it out again when stopping, a novel mechanical cut-out has been devised which, whilst being absolutely reliable and immediate in its action, is simple, and has no adjustment to get out of order. The "U.C." cut-out has been designed specially to work in conjunction with this system, and the manufacturers do not claim that it will necessarily give satisfactory results with any other type of lighting installation on which the conditions to be fulfilled are different.

The bracket carrying the rectifier is fastened to the crank-case. Adjustment is necessary when first setting up, in order to ensure that the dummy bars of the rectifying switch shall be under the brushes at the moment when the A.C. from the magneto is changing from one direction to the other. This adjustment is easily effected with the aid of the ammeter supplied on the switchboard. Provision for chain adjustment is also embodied in the bracket. A driving sprocket is supplied screwed on to the back of a new fan pulley which must replace the existing one. This is the only alteration necessary for the installation of this system. The drive from crankshaft to rectifier is taken by a chain.

An accumulator specially constructed to work with the "U.C." system, having a capacity of 15 amp.-hours at lighting rate at 10 volts, or sufficient to light the two side and tail lamps for ten hours without charging, is carried. The switchboard is fitted with an ammeter and three switches marked "dynamo," "head," and "side," the tail lamp being controlled with the side lamps. A refinement not often found is also embodied in this switchboard, viz., a plug and socket fitting for use with an inspection lamp.

The Kwik-Lok Shade Carrier.

This useful little device was designed, first of all, to save time and trouble in taking off electric lamp shades; by its use an operation, which, in the ordinary way, often takes considerable time, can be accomplished easily in a few seconds. Lamps can be easily removed for cleaning, and to its utility as a labour-saving device must be added the desirable feature that it serves as a lock tending to reduce wastage due to lamp bulbs being stolen. By means of the "Kwik-

Lok" a lamp and shade coupled can be fitted almost as easily and quickly as a bulb alone. When locked the bulb cannot be removed without disassembling the whole, and the only screwing necessary is done on the outside. With regard to the method of use, on lampholders with ordinary shade-carrier rings, the lower ring should be screwed close up to the upper one before fitting the shade. The first operation is a simple one, consisting of merely slipping the smaller end of the carrier over the cap of the lamp bulb and giving a half turn; the "Kwik-Lok" is eccentric in shape and holds the lamp firmly. Next the bulb and carrier attached are placed inside the lamp shade and the whole fitted to the lampholder, the carrier being sufficiently large to enable the lamp to be

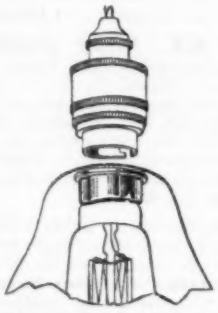

Fig. 4.—"Kwik-Lok" Lamp Shade Carrier.

fitted in the holder in the ordinary way. To complete the fixture it is now only necessary to screw the lower shade ring, provided on every holder, until it presses firmly against the top of the shade and holds it in its place, fig. 4, this operation locking the whole. Fuller's United Electric Works, Ltd., Woodland Works, Chadwell Heath, Essex, can give delivery of any quantity of these shade carriers from stock.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Electric Soldering Irons.

Having seen the interior of an Igranic soldering iron, I can testify to the correctness of Mr. Turnbull's criticisms of all irons which depend on the conduction of heat from a central bolt, to the tinned head, through a screwed connection. The Igranic iron, although of excellent workmanship, and almost new, showed by the discolouration of the screw threads an incipient oxidation of the copper surfaces, which must soon be fatal to heat transmission. Anyone who has been afflicted with a cracked soldering bit must know that transfer of heat across a minute interval calls for a heavy drop in potential across the crack.

E. C. Barton.

London, S.W.,
October 8th, 1919.

The National Union of Scientific Workers.

Your article of September 26th on "The Organisation of Research," suggests that readers would welcome information about the National Union of Scientific Workers, a thriving young association, started about two years ago, which held its first general meeting and made its constitution on October 27th, 1919. This meeting was attended by members of eleven branches. There are now over 600 members of the union.

The following are quotations from the rules of the society:—

Objects.—The objects of the union shall be:—

1. To advance the interests of science, pure and applied, as an essential element in the national life.

2. To regulate the conditions of employment of persons with adequate scientific training and knowledge, and their relations to their employers and other employés.

3. To secure in the interests of national efficiency that all scientific and technical departments in the public service and all posts involving scientific knowledge shall be under the direct control of persons having adequate scientific attainments.

4. To promote and encourage scientific research in all its branches.

5. To obtain adequate public endowment for research, and to advise as to the administration of such endowment.

6. To set up an employment bureau.

7. To secure representation on the Whitley Industrial Councils and other bodies dealing with scientific occupations.

8. To examine into and support all judicious schemes of scientific education.

9. To promote by corporate action the economic welfare of its members.

III. The union shall be registered as a trade union.

IV. Qualification for membership.—In order that he or she may be qualified for admission to membership of the union, an applicant must:—

(*a*) Be not less than 21 years of age, and

(*b*) At the time of his or her application be normally engaged in work which requires for its adequate performance a scientific training at least as complete as stated in (*c*), and

(*c*) Have passed the examination qualifying for a degree in science, technology, or mathematics in some approved University; or the examination qualifying for such diplomas as the Council of the union may from time to time prescribe; or have satisfied the Council that his or her scientific attainments are at least as complete as those stated in the preceding part of this section.

The research work of the country depends more upon the remuneration and status of the research worker than is fully appreciated. Many men who wish to be scientific workers prefer to take up employment which will enable them to support a family at an earlier age.

The formation of Industrial Councils and of Industrial Research Associations makes it imperative that scientific men and women combine, otherwise their interests will be unrepresented at a time when the division of the proceeds of industry between all parties concerned is receiving unprecedented consideration.

Helen G. Klaassen.

Croydon, *October 10th*, 1919.

Meter Reading.

Reverting to your recent correspondence on the above, I enclose a simple specimen form for flat-rate meter records from my commercial booklet, "Consumers' Accounts and Meter Department Routine." In some undertakings the month commencing the year's readings is printed at the head, but it is a mistake, as the meter-reader has to subtract downwards instead of upwards. I favour the use of loose-leaf sheets, 8 in. by 5 in., in preference to cards, as it is only a moment's work to transfer to another loose-leaf binder in the

FORM III.

Meter-reading Sheet.

The sheets may be printed in different colours, such as a Blue Sheet for Power Meter, White for Lighting, Yellow for Heating; also special coloured sheets may be used for check meters, special schemes, &c. The sheet may not be removed from the book until the meter is removed.

A printed notice may be gummed on the back of the reading book giving owner's name and address in the event of the book being mislaid.

Account No.	Address	Cheapside.				No. 1.
2006	Name					
	Meter No.	Type.	Size.	Pressure of Meter.	Pressure of Supply.	Phase.
1915					Business.	

Remarks.

Corresponding Units last year.	Date of Reading.		Index.					Units Registered.	Units Chargeable.	Reader.	Remarks.	Report No.
	Mar.											
	Feb.											
	Jan.											
	Dec.											
	Nov.											
	Oct.											
	Sept.											
	Aug.											
	July											
	June	30/6/15	1	0	8	8	8		277	M. N.		
	May	29/5/15	1	0	6	1	1		319	C. D.		
	April	30/4/15	1	0	3	0	1		478	A. B.		
	Brought forward 9823 direct.											

office the sheets which have been completed by the readers daily, the accounts for which may be rendered the day following if necessary.

In a recent issue Mr. Turnbull asked for a thin wet-proof loose-leaf binder, and if he has not succeeded in obtaining one I think I can assist him.

A. C. Glover.

Chelmsford,
October 9th, 1919.

The Compilation of Trade Publications.

Further to my letter of the 23rd ult., which appeared in your issue of the 26th ult., I would like to bring to your notice the following extraordinary fact which occurred in connection with a recent visit which I paid to the Shipping, Engineering, and Machinery Exhibition at Olympia.

On entering, I immediately purchased a copy of the official catalogue, and being particularly interested in switchgear, endeavoured to ascertain from the official catalogue what manufacturers of switchgear were exhibiting, so that I could pay a visit to their respective stands. In order to ascertain this, however, I had to wade through the whole of the catalogue of nearly 500 pages, simply because a classified index is not included in the compilation. It seems almost inconceivable that such an important catalogue could be compiled with this very striking omission, and it is to me only another example of the lack of thought and special consideration which characterises British trade compilation.

Many supporters of trade exhibitions regard the official catalogue as of even greater importance than the exhibition itself, as it so often includes useful information of up-to-date practice, and becomes a directory of the most progressive and up-to-date manufacturers. Without a classified index, however, everybody will agree that the official catalogue loses 90 per cent. of its value.

P. W. Laverick.

London, W.C.,
October 9th, 1919.

Air Supply for Pianolas.

With reference to Mr. Spencer's inquiry *re* the above, I quite agree with Mr. C. H. Nicholson that a centrifugal fan is not suitable for the work, not only, as Mr. Nicholson states, due to the characteristics of the fans which make them suitable only for delivering or exhausting large volumes of air against small pressure or vacuum, but also because a fan capable of producing sufficient vacuum to operate a piano-player would be inconveniently large.

I have made experiments with a view to adopting electric power, but the result was unsatisfactory. In all piano-players, in spite of the numerous expression and control devices which are fitted, it is only possible to get good effects by varying the speed and pressure on the pedals, and any power-driven apparatus will only give inferior results. The vacuum required varies considerably in different players, the maximum, I believe, being about 30 in. water gauge

P. R. Boulton.

Electricity Works, Nechells, Birmingham.
October 13th, 1919.

Fault Localisation.

I am indebted to Mr. G. W. Stubbings for his very sound article on fault localisation in your current issue, and am pleased to find that his views and methods of testing coincide more or less with my own, from which it is easy to see they are the result of much practical experience.

I was very interested in his method of locating a fault on a concentric cable by utilising his service tappings for testing points, as it is practically identical with a test I adopt on both earth and short-circuit faults on D.C. triple-concentric distributors, which has not yet failed me in one single instance, to reduce the fault to one of two service or straight joint boxes.

For an earth fault I short-circuit the cores at one end of the cable, pass a current through the faulty core to earth from a single 16-C.P. lamp at the opposite or testing end, and measure the drop in M.V. across the consumers' services connected to that side of the system. As the fault is neared, so does the reading decrease accordingly, until a point is reached when the reading is zero. As a check I repeat the test from the other end, which invariably agrees with the first test.

For a short circuit and no earth, the current is passed into one of the faulty cores at one end, and at that same end the other core is earthed, or connected to the neutral of the supply, to complete the circuit. The test is then a repetition of the test for an earth, except that the cores are left open-circuited at the end remote from the testing end.

I was amused at Mr. Stubbings's reference in his opening remarks to the difficulties one has to contend with when working in the streets, and I can recall instances when not only school boys formed the audience, but such things as a flock of sheep became entangled in the testing wires, or I received an occasional smack in the back with a perambulator propelled by a window gazer.

Such instances as these along with a multitude of others all have an adverse effect (especially out of working hours) on the successful result of carrying out a location test, and unless the mains engineer responsible is possessed of the necessary patience and perseverance, combined with prompt decision, his lot will be all the harder.

Mr. Stubbings ably refers to this in his closing remarks, which I commend to your readers as one of the essentials to success.

P. Wardle.

Corporation Electricity Department,
Carlisle, *October 13th*, 1919.

BUSINESS NOTES.

Foreign Trade.—September Figures.—The following are the electrical and machinery figures given in the official returns of imports and exports for September :—

	September, 1919.	*Inc. or dec.*	9 *months*, 1919. *Inc. or dec.*
Imports.	£	£	£
Electrical goods, &c. ...	93,121	+ 9,773	+ 150,055
Machinery	1,243,419	+ 343,101	+ 3,054,751
Exports.			
Electrical goods ...	474,786	+ 284,706	+ 2,268,015
Machinery	3,072,627	+1,888,732	+ 9,275,209

The American G.E. Export Activities.—We have received a printed announcement dated London, July, 1919, in the following terms :—"The General Electric Co. (of New York) takes pleasure in advising you that for the purpose of conducting its foreign business there has been organised the International General Electric Co., Inc., and requests for the latter company the continuance of your valued patronage. Communications relating to foreign business should be addressed to the new company at 83, Cannon Street, London, E.C. 4."

Workmen's Compensation Case.—In the Shoreditch County Court, last week, there was an application to Judge Cluer, for the entering of an agreement under the Workmen's Compensation Act. The application was made on behalf of Charlotte Kennedy, an infant, who was injured while in the employ of the Little Wonder Battery Co., Ltd., Willow Street, Great Eastern Street, on November 11th, 1918. She was injured by a piece of plaster falling on her head, and had been paid 25s. a week compensation ever since ; she was earning £2 a week at the time of the accident, working on electric batteries. It was now proposed to settle the claim for £40, and the girl could then go into the country for a time and get herself into proper health, as her head was still affected. The girl herself knew that she had to make some mental effort. Judge Cluer said he failed to understand what mental effort they expected to get out of a girl 16 years of age. They might take her to a Christian Scientist, some people had faith in them, but he doubted if it would be the slightest use. He did not think that £40 was anywhere near enough, so he would leave the compensation at the 25s. a week, out of which she could easily be kept in the country if it were so desired. He refused to enter the agreement.

British Catalogues Needed in South Africa.—According to Press reports, a plentiful supply of British trade literature should be promptly sent throughout South Africa, as literature of the kind relating to American manufactures is being distributed in great quantities to business houses and libraries there. British manufacturers and traders should forward their publications to the commercial reference libraries of H.M. Trade Commissioners as well as to public bodies and trade organisations.

G.E.C. S.D. Conduit.—The General Electric Co., Ltd., is once more able to effect prompt deliveries to the trade of G.E.C. solid-drawn conduit. Until recently the whole of the output was reserved for urgent war requirements. In addition to the saving due to the reduction in number and magnitude of Government orders, the G.E. Co. has been able very considerably to augment its output.

Engineering Trade Amalgamation.—The following firms have amalgamated under the title of The Agricultural and General Engineers, Ltd. :—Messrs. Aveling & Porter, Ltd., of Rochester ; Messrs. E. H. Bentall & Co., Ltd., of Heybridge ; Messrs. Blackstone & Co., Ltd., of Stamford ; Messrs. Richard Garrett & Sons, Ltd., of Leiston ; and Messrs. James & Frederick Howard, Ltd., of Bedford. Most of these businesses have been established well over one hundred years. The Amalgamation will have a capital of three millions sterling, and it has been formed with the view of employing a large amount of British labour on mass productions. The different firms will in no sense lose their identity, nor is the management to be changed, the whole object being mass production and efficient selling organisation. The various works will specialise in their chief products. They will be greatly extended, and already a great amount of this work and the purchase of new tools has been undertaken. The head offices of the Amalgamation will be at Central House, Kingsway, London, but until the Government Department which is now in possession of Central House has removed (which will be in the course of the next two months), the temporary offices are at 50, Pall Mall, London, S.W. 1.

Stocks of Non-Ferrous Metals.—The stocks in possession of the Minister of Munitions on October 1st, 1919, were : —Copper, 22,784 tons ; spelter (G.O.B.), 19,046 tons ; spelter (refined), 10,759 tons ; aluminium, 10,004 tons ; soft pig lead, 73,560 tons ; nickel, 1,966 tons ; antimony regulus, 3,300 tons. A proportion is already sold to the Trade for forward delivery.

Engineering War Wages.—It is announced in the daily Press that, owing to an engineering conference at York, the conference between Sir Robert Horne and representatives of employers and Unions in the engineering and shipbuilding trades, to discuss the consolidation of war advances and war bonuses into permanent rates of wages, and the extension of the Wages (Temporary Regulation) Act, which was fixed for Tuesday last, has been postponed and will probably not take place until next week.

Admiralty Industrial Council.—The first meeting of the Admiralty Departmental Industrial Council set up under the scheme for the application of the Whitley Report to Government industrial establishments was held last week. Among the representatives of the Trade Unions, we note the name of Mr. J. Rowan, who is acting on behalf of the Electrical Trades Union.

Whitley Councils for Postal Workers.—*The Times* understands that agreement has been reached between the rival groups of postal workers with reference to the setting up of Whitley Councils. It has been decided to form two councils, one to deal with the general operative staff and the other to look after the interests of the engineering section. The Government, which took no part in the recent controversy, but left the rival organisations to fight the matter out between themselves, have agreed to the decision. The question whether clerks in the engineering section should come under the General or the Engineering Council has given rise to some difference of opinion, but it is anticipated that the matter will be adjusted without difficulty.

Non-Ferrous Metal Industry Act.—Lists of further licences granted under this Act were published in the *London Gazette* for October 10th and 14th.

An Australian Reply.—Replying to a German inquiry regarding Australian manufactures, a firm of Geelong merchants wrote:—"We do not desire to have anything to do with Germany. Your sea warfare amounted to murder and barbarism, and your vile treatment of prisoners of war alone will damn your country for generations."—*Times.*

Book Notices.—"The Reflecting Power of Stellite and Lacquered Silver." Scientific Paper No. 342 of the Bureau of Standards. Washington: Government Printing Office. Price 5 cents.—This is a new publication of the Bureau of Standards, showing that the reflecting power of stellite varies somewhat in the visible spectrum, depending upon the homogeneity and, no doubt, upon the exact composition of the alloy. Measurements on lacquered silver mirrors, made before and after exposure to ultra-violet light, show that, owing to photochemical action in the lacquer, the silver is turned brown in colour, thus reducing the reflecting power. Anyone interested may obtain a copy of the paper by addressing a request to the Bureau of Standards.

"The *Financial Times* Investments Account Book." London: The *Financial Times*, Ltd. 8s. 6d. net.—This is a very useful book in which investors can keep on record for reference at a glance particulars of their holdings in different companies, secretary and registered offices, interest or dividend dates, date of purchase, price paid, market quotation, income-tax, date of sale, selling price, net yields and profit. Fifty double-page ruled tables are provided for. The opening pages of the book tabulate the return on stock at stated percentages, and brief details of the most important British Government loans.

"The Ultra-Violet and Visible Transmission of Eye-Protective Glasses." By K. S. Gibson and H. J. McNicholas. Technologic Paper of the Bureau of Standards, No. 119. Washington: Government Printing Office. Price 10 cents.—Thanks are due to the Bureau of Standards for investigating this very important subject. The Paper gives general information on the nature and properties of ultra-violet rays, and particulars regarding 82 samples of glass designed to protect the eyes against them, of which two are noted as highly efficient, while five others, though not so effective, have the advantage of being practically colourless. The apparatus employed for the investigation is described, and the results are embodied in a series of curves.

After an interruption of five years, due to obvious reasons, the *Revue de l'Ingénieur et Index Technique* has resumed publication, in close association with the Bureau d'Organisation Economique of Paris. In addition to a number of technical articles, the *Revue* contains market prices, reviews of books, and the index to technical articles formerly carried on by the *Institut Technique Industriel*, of Brussels.

The autumn number of the *M. & C. Apprentices' Magazine* contains an interesting article by Mr. Sam Mavor, on "Belgium Revisited," further "Reminiscences" of Mr. Henry Edmunds, and a varied range of short articles and notes—including recollections of Nurse Cavell, by Mr. H. Cappian—well up to the usual high standard.

"Private Companies: their Utility and the Exemptions they Enjoy." By H. W. Jordan. Ninth Edition. Pp. vi + 71. London: Jordan & Sons. Price 1s. 4d.

"Reminders for Company Secretaries." By H. W. Jordan. Fourth Edition. Pp. vi + 32. London: Jordan & Sons. Price 11d.

"Science Abstracts." A and B. Vol. XXII, Part 8, No. 260. August 30th, 1919. London: E. & F. N. Spon, Ltd. Price 1s. 6d. each.

"Abstracts of Papers in Scientific Transactions and Periodicals." New Series. No. 1. October, 1919. London: Institution of Civil Engineers.

"Statistical Report of Electric Undertakings in Japan." Tokio: Director-General of Electric Exploitations.

"Circular of the Bureau of Standards." No. 81. "Bibliography of Scientific Literature Relating to Helium." Washington: Government Printing Office. Price 5 cents.

"Electric Power Transmission." By A. Still. Second Edition. Pp. xviii + 403; 147 figs. London: Hill Publishing Co., Ltd. Price 17s. 6d. net.

"Railway Electrification: Melbourne Suburban System." By E. P. Grove. Melbourne: *Commonwealth Engineer.*

Glasgow Exhibition.—At the Housing and Lighting Exhibition in the Kelvin Hall of Industries, promoted by the Corporation, the electric lighting, heating, and cooking exhibits were attractively shown. Messrs. Falk, Stadelmann & Co., Glasgow and London, had a prettily decorated stall displaying electroliers and radio-electric fires. Messrs. Curtis & Harvey, Ltd., London, had an excellent stand showing products of their Dartford factory. The Electricity Department of Glasgow Corporation demonstrated the use of electricity for all household purposes. Carron Co., Stirlingshire, had a varied collection of electric cooking and heating stoves, and labour-saving appliances. Other exhibits displayed the use of electricity in the home, as, for example, the Rex Import Co., Ltd., with their electric clothes washers, vacuum cleaners and potato peelers; also the "Thor" electric washing machine, staged by Messrs. C. E. Beck & Co., Ltd. The Corporation is doing everything possible to advocate the use of electricity in Glasgow for household purposes, and the practical demonstrations were closely followed by large and approving audiences.

Australian Government Contracts and the Country of Origin.—The New South Wales Government has decided that all tenders for materials required for Government departments, shall state the country of origin or manufacture, and the various departments have been notified.—*Tenders.*

The Strike of Ironfounders.—A ballot is being taken of the members of the three societies concerned regarding the question of accepting the terms submitted. It is stated that if the result is in favour of acceptance, work cannot be resumed before 20th inst.

Catalogues and Lists.—The Consolidated Pneumatic Tool Co., Ltd., Egyptian House, 170, Piccadilly, London, W. 1.—Catalogue No. 41 of 98 pages contains illustrated information relating to a variety of the company's pneumatic tools—hammers, rivetters, drills, grinders, hoists, &c. Notes on the care of pneumatic tools, an index to code-words, tabulated sizes, weights, &c., are given. Special circular No. 58A (third edition) also received, consists of 20 pages of well-illustrated matter concerning Class "N" single-enclosed self-oiling steam and belt-driven air compressors.

Messrs. Siemens Bros. & Co., Ltd., Palace Place Mansions, Kensington Court, London, W. 8.—Pamphlet A720 contains a full and illustrated description of the Siemens mine shaft electric signalling apparatus.

National X-Ray Reflector Co., 235, West Jackson Blvd., Chicago.—Pamphlet on eye-comfort.

The British Electric Transformer Co., Ltd., have issued some "Introduction Books" containing a number of forms for use by contractors and others who wish the company to make demonstrations of any particular piece of apparatus at their new 'Tricity showrooms at 50, Oxford Street, London, W. On the reverse side of each slip particulars of 'bus routes are given. Books will be sent to any contractor on application.

Patent Restoration.—An order has been made restoring Patent No. 2,343, of 1914 (W. R. Pilkington), "Improvements in air or other fluid-pressure pumps."

Developments at Palmer's Works.—Mr. G. Mure Ritchie addressing the Palmer's Shipbuilding, &c., Co., Ltd., on October 1st, referred to the benefit that the company was feeling from improvements made at the iron and steel works. They had largely increased the output of pig iron by introducing modern gas-driven blowing engines. There was consequently a greater volume of gas produced at the blast furnaces which enabled them to utilise a further unit recently added to the gas-cleaning plant, and thus further enabled them to obtain more power for their gas-driven engines. They were now working with three gas-driven blowing engines and six gas-driven electric generating sets, and they were installing a fourth gas-driven blowing engine and a further two gas-driven generating sets. They were increasing the capacity of the boiler shops owing to the demand for large sizes of ship's boilers. At the Hebburn Shipyard, owing to the installation of a further large air compressor, necessitated by the increased use of pneumatic tools in that yard and the number of electrically-driven machine tools now in use, it had been found necessary to build and equip a new sub-station to augment the supply of electrical current to meet the demand.

Standardisation of Chains.—The Association of British Driving Chain Manufacturers announce that they have now completed the standardisation of roller chains up to ¾ in. pitch. For the convenience of chain users, and to insure complete interchangeability they have also standardised chain wheel tooth forms. These new tooth forms while not being identical with any of the existing forms incorporate the essential features of each. Particulars of the standards set up by the Association of British Driving Chain Manufacturers are to be published in pamphlet form, which will be obtainable from the secretary of the Association of British Driving Chain Manufacturers, Bassishaw House, Basinghall Street, London, E.C. The Association comprises the following well-known firms: Alfred Appleby, Ltd., Birmingham; Brampton Bros., Ltd., Birmingham; "The Coventry" Chain Co., Ltd., Coventry; Perry & Co., Ltd., Birmingham; Hans Renold, Ltd., Manchester.

Liquidations.—W. G. Ayers & Co., Ltd., 3, Cannon Street, London, E.C., electrical engineers.—A largely attended meeting of the creditors of the above was held on October 11th at the Mansion House Restaurant, Queen Victoria Street, E.C., when Mr. E. H. Hawkins, of Messrs. Poppleton, Appleby & Hawkins, 4, Charterhouse Square, E.C., was elected to the chair. Mr. J. S. Gates, C.A., of Cheapside, E.C., stated that he had been appointed to act as liquidator in the voluntary liquidation of the company. The latter was registered in October, 1918, when Mr. Ayers and Mr. W. Ashley between them subscribed for shares to the value of £100, which they paid for in cash. Little business was done by the company between October and December of last year, but early in the present year it was suggested that a friend would invest from £700 to £1,000 in the concern. It seemed that the business was carried on in the expectation of that money being received, but finally the proposed investor refused to find the money. Mr. Gates added that when he came to examine the books he found that they had not been properly kept, and were not written up to date. He had completed the books so far as possible, and it seemed that the liabilities to the creditors amounted to between £4,000 and £5,000. The assets consisted of book debts of nearly £2,000. When he was appointed liquidator there was no stock remaining, while the balance at the bank, which was in credit to the extent of £15 or £16 had been garnisheed. The only shareholders were Messrs. Ayers and Ashley, who were also the two directors. The company possessed a secret process in connection with an electric lamp which would prevent the metal filament breaking. One of the directors claimed to be the proprietor of the process, which he said had never been sold to the company. As the liquidator, however, he was claiming that the process belonged to the company. He had not been able to trace any papers showing that the process had been assigned to the company. The lamps made under the process were sold at from 2s. 3d. to 4s. 9d. each, and showed a gross profit of about 33 per cent.

Mr. Ashley said that had the company continued large profits would have been made from the lamps, and he was willing to hand over the secret process to the liquidator.

A creditor for a large sum said he had seen the lamps, and was of the opinion that the process was of considerable value.

Replying to questions by the chairman, it was stated by Mr. Ashley that the directors did not think till a few weeks ago that the company was in financial difficulties. He admitted that creditors had been suing the company for some time past, while in June a petition was presented for the compulsory winding up of the concern.

Mr. Gates said that in September he was asked to go into the question of the finances of the company. He prepared rough figures which showed that the company was insolvent to the extent of about £2,000, and he advised the directors that they ought not to carry on.

The Chairman: And after that date, when liquidation had been practically decided upon, a telegram was sent to a creditor I represent asking him to send all the goods he could at once.

A creditor who said he was interested for £600 stated that on September 13th last the directors knew the company was insolvent, and yet on that day they ordered some hundreds of pounds' worth of goods from him, and later telegraphed to him for goods to the value of £400.

The position disclosed was discussed at some length, and eventually it was decided that an application should be made to the Court for the appointment of Mr. E. H. Hawkins as joint liquidator with Mr. Gates. A committee of inspection of five of the principal creditors was also nominated.

Wensleydale Gas & Electricity Co., Ltd.—Winding up voluntarily. Liquidator: Mr. C. H. Wilson, 7, Greek Street, Leeds. Meeting of creditors, October 22nd.

The Leipzig Fair.—At the German National Industrial Fair, held in September at Leipzig, some 10,000 firms, mostly German, exhibited, and there was a record attendance of about 118,000 people, about 20 per cent. more than in any previous year. The secretary of the fair stated that there were some 7,000 foreign buyers present. The general impression gathered from conversation with representative exhibitors was that nearly all branches of German industry are on the verge of bankruptcy, due principally to the shortage of coal, and secondly, to the loss of export trade which carries with it the inability to purchase much needed foreign raw materials. In order to assist in forcing a wedge into foreign markets, the German manufacturer has concentrated on new mechanical devices and novelties, which were much in evidence at the fair. Most of the German representatives inclined to the opinion that they would recover their export trade through American and neutral buyers, and that much as they would prefer to re-establish their pre-war trading connection with England, they felt that at present, due to the hostility of the English towards them, they had better concentrate on America and the neutral nations surrounding Germany. From the point of view of the German export, probably the most important exhibits were those of the technical section including all types of new machine tools, mechanical and electrical devices and novelties. In this industry the Germans were in a position to fill orders quickly, and in many cases had considerable stocks on hand, due to the facts that, first, they had not been short of iron ore and coal during the war to the same extent as industries relying on foreign raw materials, and secondly, there was little home demand to be met.

The mechanical engineering industry depends upon foreign trade for its stability, and is concentrating as much as possible on fine mechanical precision machinery and articles in which the raw material and coal used bears as small a percentage as possible to the value of the finished article. The accuracy of the work done by the machinery exhibited, and the finish of the machines themselves, left nothing to be desired except that every effort was made to avoid the use of brass. For instance, in lieu of expensive brass grease cups or cheap cast-iron ones, the Germans were using a finely finished pressed steel article.

The following points summarise the general impression conveyed by this section:—

(*a*) Delivery from stock can in most cases be obtained for machine tools. In this connection, the representative of a large Dresden firm stated that they had actually in stock 25-40 of each type, from the largest to the smallest machines.

(*b*) The prices are approximately 200-400 per cent. up on the pre-war basis.

(*c*) The German firm arranges all the necessary export regulations and shipping, leaving the import side to the importer. Cash must be deposited in the German bank on the receipt of invoice that the goods are ready to be despatched, or, in some cases, that they have already been forwarded.

(*d*) International banking regulations with England have not yet been re-established in the unoccupied area, although for the last six months a considerable amount of business has been transacted with Holland, Norway, Sweden, Spain, and North and South America.

(*e*) A very high proportion of the goods sold during the last six months has been for export.

(*f*) The chief factor limiting output is coal.

(*g*) Patents.—Much specialised new machinery was seen, and in many cases the Germans are only too willing to sell the covering patents to foreign manufacturers.

This (*g*) appears to be one of the most important facts brought to light during the whole fair, and if expert technical men had been present representing British firms in the various industries, they would have found much of vital interest to them in this respect.

The whole fair showed the desire of the German nation to work and recover itself, but everywhere one was struck with the hopeless dependency of Germany on foreign raw materials and increased coal output. In fact, with the German glass, pottery, textile, leather, toy, and many other industries closed down, or operating at 5 per cent. or 10 per cent. of their normal output, due to inability to purchase raw materials at the present value of the mark, the fair gave direct evidence of Germany being at present in a very difficult position.

Engineering Trade with Chile, Peru and Bolivia.—The Department of Overseas Trade (Development and Intelligence) and the British Engineers' Association will shortly despatch to Chile, Peru, and Bolivia a joint investigator to ascertain the conditions and prospects for the sale of British engineering products in that market. The cost of the investigation is being defrayed by the Association and His Majesty's Government. The subjects to be covered by the investigator include imports, shipping methods, customs tariffs, legislative regulations and restrictions, statistics, and competition.

The investigation will be pursued in the following directions: Civil engineering; power plant and accessories; mining plant (not tools); plantation machinery; machine tools; vehicle (railway, road, water, air); electrical machinery and plant (not electrical accessories); agricultural and dairy machinery (not inplements). Firms who are not members of the British Engineers' Association may participate in the inquiry on payment before the receipt of the first report of a fee of twenty guineas, provided they are British manufacturing engineers or shipbuilders, or British manufacturers of articles necessary to engineering plant, or producers of raw materials, or British companies, firms, or individuals who, while not possessing works of their own, hold patents or other proprietary rights in engineering plant or accessories thereto and contract for the manufacture of their specialities with members of the British Engineers' Association. Any communication relative to this investigation should be addressed to the Comptroller-General, Department of Overseas Trade (Development and Intelligence), 4, Queen Anne's Gate Buildings, Westminster, S.W.1, or the secretary, British Engineers' Association.—*Board of Trade Journal.*

Black Lists Abolished.—The Foreign Office announces that the Black Lists, the withdrawal of which was announced in May last, has now, according to a decision of the Supreme Economic Council, been definitely abolished.—*Times.*

Trade Announcements.—Turner Bros., electrical and power engineers, of Huddersfield, have removed their business to the Seedhill Electrical Works.

Messrs. Parkinson Bros., electrical and mechanical engineers, Morecambe, have commenced business, after service with the Army and on war work.

LIGHTING AND POWER NOTES.

Accrington.—Increased Prices.—The Electricity Committee has increased charges as follows:—Lighting, flat rate of 7d. per unit, with minimum charge of 5s. per quarter in summer and 10s. per quarter in winter; heating and domestic purposes, through separate meter, 2½d. per unit; rateable value basis, 15 per cent. on value and 2d. per unit; and for power, sliding scale from 4d. per unit for first 100 to 1½d. per unit over 6,500 per quarter.

Bantry (Co. Cork).—Price Revision.—As from October 1st, charges for electricity have been revised as follows:—Lighting, 11d.; power, 6d.; meter and house-service rent, 10d. The pre-war charges were:—Lighting, 7d.; power, 4d.; a war advance of 20 per cent. was imposed on May 1st, 1918.

Barrow.—Increased Prices.—Owing to the increase in the price of coal the T.C. has decided to increase the basic price by ¼d. per unit, and retain the existing war increase of 30 per cent.

Beauly (Inverness-shire).—Price Increase.—The price of electricity has been increased to 1s. per unit.

Beckenham.—Extensions.—It is proposed to install a 1,000-kw. Brush-Ljungatrom turbine at a cost of £16,500.

Loan.—Application is to be made to the Ministry of Health for sanction for a loan for the above plant, together with £2,500 for mains, £4,000 for services, and £2,000 for meters.

Birmingham.—It has been decided to spend £120,000 in the purchase of equipment for the permanent generating station, to be erected at Nechells. This will include 17 square wooden cooling towers, an elaborate set of coal-handing plant, and a number of transformers. The Committee hopes it may be possible to have a portion of the generating plant running by the winter of 1920.

Carlisle.—Year's Working.—The annual accounts of the electricity undertaking for the year ended March 31st, 1919, show a total revenue of £39,378 and a total expenditure of £27,211, leaving a gross profit of £12,167. After all capital charges had been deducted, a net profit of £923 was shown. The number of units sold was 5,560,321.

Chelmsford.—Price Increase.—The E.S. Corporation, Ltd., has applied to the B. of T. for permission to further increase by 2d. per unit the maximum charge of 8d. per unit for energy.

Chesham.—Price Increase.—The E.L. Co. has increased the charges for public lighting by 50 per cent.

Continental.—France.—It is reported that owing to the strike of metal workers and dockers, Brest is without water and electricity. The strike is assuming serious proportions; a large number of casualties have occurred, and the Arsenal, metal, and transport workers, electricians, and builders, having come out. The water and electricity supplies are being maintained by the military.

Spain.—New Power Scheme.—Concessions have recently been granted for the establishment of plant for the utilisation of the water power of the River Turia for electric lighting and power purposes, one at Chililla, and one at Jestalga (Province of Valencia).

Coventry.—Increased Prices.—The T.C. has increased the existing charges for electricity for lighting and heating by 66⅔ per cent., in lieu of a former advance of 20 per cent., as from October 1st. The hiring charges for motors is increased by 50 per cent.

Davenham.—Extensions.—The R.D.C. has reported favourably on the Northwich Electric Supply Co.'s scheme to extend the electric mains from Leftwich to Davenham, by means of overhead standards and cables.

Edinburgh.—Loan.—The Secretary for Scotland has consented to the borrowing by the Corporation of a further sum of £950,000 for executing the capital works of the Edinburgh Electric Light Order. This raises the whole sum authorised to £2,280,000. The expenditure is in connection with the new works at Portobello.

Elland.—New Station.—The D.C. has secured a plot of land at Timber Street, for the erection of a new transforming station. It has been agreed that as soon as the necessary erections are put up, the Yorkshire Electric Power Co., Ltd., shall provide the Council with energy, instead of the Council generating its own as has hitherto been done.

Eston.—E.L. Scheme.—The Urban Council has decided (October 7th) to seek powers to deal in electricity, and to borrow money for that purpose.

Glasgow.—Year's Working.—The returns for the year ended May 31st, 1919, show a gross income of £865,039, against £789,002. The working expenditure was £567,259, against £542,717. This gives a net revenue of £297,780, against £246,285; £98,073, compared with £86,551, was relegated to the sinking fund. The amount paid in interest on loans was £106,482, against £92,454. The balance on the year's working was £93,226, against £67,280. From this, £60,464 was written off as depreciation of capital account and sinking fund, last year's figure being £60,134. The surplus on the year's operation was £32,762, compared with £7,146, which was transferred to the reserve fund, which now amounts to £64,008. Cost of energy per unit sold was 1·3781d., against 1·2091d. last year. Average price per unit received from consumers was 1·4324d., compared with 1·2201d. last year. The number of consumers was 37,130, an increase of 1,631. The quantity of energy sold to private consumers was 143,501,788 units, *i.e.*, 22,022,869 lighting, 121,478,919 heating and power—a decrease of 7·1 per cent. The total number of motors in use was 13,730, of a total B.P. of 113,721, compared with 12,904 motors, of total H.P. of 105,739. Total maximum demand connected to mains was 141,967 kw., compared with 132,316 kw., an increase of 7·29 per cent. Maximum demand on station during winter, 59,168 kw., increase of 6·4 per cent. At Port Dundas sub-station one 1,000-kw. motor generator has been installed, making the station capacity now 5,000 kw. The erection of the 20,000-volt sub-station for receiving supply for New Dalmarnock power station is now completed, and will probably be in commission this winter. At Pollokshaw Road station two 1,500-kw. rotary converters, by Messrs. Bruce Peebles and Co., and one 1,000-kw. rotary converter, by the B.T.H. Co., have been installed. At Govan and Partick stations structural alterations are being made to enable them to take a 20,000-volt supply from Dalkarnock. Sites for new sub-stations at Rigby Street, Parkhead, Holmfauldhead Drive, Govan, Possilpark, Bilsland Drive and Polmadie, have been purchased, and stations are in course of erection. A site near Waterloo Street sub-station and offices has also been purchased for a new sub-station, laboratories, and workshops. There are now 65 sub-stations on consumers' premises, an increase of 23 since May, 1918, and a further 16 sub-stations are in course of erection. The first section of the buildings of Dalmarnock power station were all but complete in May, 1919. One boiler-house with eight boilers is completed. One 18,750-kw. turbo-alternator, by British Westinghouse Co., is nearly completed, and all auxiliary plant being erected. The switch-house is finished, and it is hoped to have one set in use for the maximum load this winter. During the year ¼ mile of L.T., 2½ miles of H.T. feeders, and 2½ miles of distributors, were laid on the north side of the river, and ½ mile of L.T., 6½ miles of H.T. feeders, and 2½ miles of distributors, were laid on the south side of the river.

New Rectifier.—The electrical engineer and a member of the Electricity Committee are being sent, by the Corporation, to Switzerland to see a new electrical device for rectifying alternating to direct current, which Messrs. Brown, Boveri & Co. have in operation.

Hanwell.—Electricity *v.* Gas.—Electric street lighting has been resumed on pre-war scale, but, "owing to the greatly increased cost," only 50 per cent. of the gas lamps are to be lighted.

Ilkley.—Loan.—The U.D.C. has decided to apply for sanction to borrow £2,000 in respect of excess expenditure in connection with its electricity works, £3,000 for additional mains and services, £2,000 for land near the sewage works for extensions to the works.

India.—It is reported that the investigation of the hydro-electric scheme for Ootacamund from the Sandy Nullah stream, at Waterfall Shola, is making satisfactory progress, and it is expected that it will be shortly completed. The investigation, it is understood, has shown that an available fall of 1,050 ft. is possible, which will mean 600 E.H.P. throughout the working period of six hours per day. The distance from Ootacamund is only about five miles. If for any reason the Koonda river hydro-electric scheme, which is a much larger one, intended to supply Wellington, Coonoor, and, possibly, Coimbatore, fails to be carried out, the Sandy Nullah scheme will be available to meet the needs of Ootacamund. The investigation of the Koonda river scheme is also proceeding apace, and negotiations are going on with Messrs. Tata & Sons in connection therewith.

A hydro-electric scheme is also under consideration in Datia State, where the hilly character of the extreme western portion of the State offers small but useful possibilities for the generation of electricity by means of water power. A catchment area, amounting to about 90 square miles, has been surveyed near Angra village, across Anghora Nala, and it is estimated that about 500 H.P. will be obtained with a fall of 75 ft. This would be a sufficient output to light the principal towns in the State, and to supply power for the various mills and factories. The State is extremely flat, and the capital outlay on transmission lines will not be very large.—*Times of India.*

Kempston.—Bulk Supply.—There is a proposal afoot to obtain a supply of energy from the Bedford Corporation. Inquiry into the cost of transforming plant, cables, &c., is being made.

South Africa.—Johannesburg.—The municipality proposes to spend an additional sum of £36,502 on the purchase of two 3,000-kw. steam turbo-alternators, for which an original vote of £70,000 was passed in March, 1916. It is also proposed to spend sums amounting to about £30,000 on a motor converter, automatic switches, new feeder, and instruments.

Kilmarnock.—Extensions.—The Corporation electric power station has now been linked up with Ardrossan shipyard and harbour, and all the electricity used there for power and lighting purposes is provided from this source.

King's Lynn.—Year's Working.—The annual report on the electricity undertaking for the year ended March 31st, 1919, shows a total expenditure of £8,065 and a total revenue of £12,898, thus giving a gross profit of £4,833, and after all capital charges had been deducted, the balance-sheets show a net profit of £1,924, against £2,146 last year. The total number of units sold was 738,562, as compared with 768,106 last year. The number of private connections was 1,056, an increase of 10; number of motors was 205, amounting to 1,396 H.P., an increase of 3 motors or 185 H.P. Maximum supply demanded, 495 KW.

Kingston-on-Thames.—Price Increase.—The T.C. has applied to the B. of T. for an order to modify the statutory powers for charges for electricity from 13s. 4d. up to 20 units per quarter and 8d. beyond, to 13s. 4d. and 10d.

Leyton.—Price Increase.—The Electricity Committee has decided to increase the charges by 50 per cent., to take effect as from the Christmas quarter. This makes a total advance of 100 per cent. on pre-war charges.

Llandudno.—Water-Power Scheme.—The Urban District Council is considering a proposal that electricity should be generated by the water power from the lakes in Carnarvonshire. It is estimated that there is sufficient water power to drive turbines to produce all the energy needed for the town.

London.—L.C.C.—The Council is recommended to sanction the borrowing of £10,666 by the Battersea B.C. for electrical plant, and £2,000 by the Bermondsey B.C. for electrical purposes.

Maidstone.—Year's Working.—The accounts for the year ended March 31st, 1919, show a total revenue of £31,341, against £26,630 last year, and a total expenditure of £23,801, against £18,600 last year, thus giving a gross profit of £7,540, against £8,030 for last year. After paying all capital charges, the balance-sheet shows a loss of £176, as compared with a profit of £715 last year. The loss was due to lighting restrictions, and, among other war difficulties, the high cost of new plant which was not then in commission. The number of units supplied was 3,877,930, compared with 3,866,684 for last year.

Middleton.—The T.C. has increased the price of electricity for lighting to 7d. per unit, and for power by an additional 5 per cent. as from October 1st.

Portsmouth.—House Wiring.—It is reported that the T.C. proposes to wire all houses for electric lighting.

Ramsgate.—Proposed Price Increase.—Application for the price of electricity to be increased by 1d. per unit has been refused by the B. of T.

Redditch.—Year's Working.—The financial position of the Urban District Council's electricity undertaking is improving. The accounts for the year ended March 31st last, show income amounting to £23,186, and expenditure, £22,713, leaving a profit of £873. A sum of £1,500 was put aside as reserve for capital repayments. The cost of generation and distribution was £17,500. The outstanding loans amount to £64,825.

Skegness.—Time Extension.—The B. of T. has granted the U.D.C. an extension of six months for carrying out the E.L. Order of 1914. The Council has decided to apply for a year's extension.

Stoke-on-Trent.—Revision of Prices.—On account of the deficits of the past three years, it has been decided to revise the various prices for energy, and standardise them as much as possible.

Sunderland.—Breakdowns.—Four breakdowns of the new 7,500-KW. turbo-generator recently installed at the electricity works have occurred within a week.

Whitehaven.—Minimum Charge.—The T.C. has decided to fix a minimum charge of 30s. a year for consumers of electricity.

Swansea.—Year's Working.—The total income was £58,791, as compared with £42,333 last year; expenditure, £39,038, as against £24,550, leaving a gross profit for the year of £19,752, as against £17,782 a year ago. On the net revenue account, after paying loan charges, &c., there is a net profit shown of £4,825 for the year, as against £3,254 in the previous year. The reserve fund now stands at £14,051. During the year the capital expenditure was increased to £280,403, but against that there was set aside as sinking fund, &c.; £113,065, which represented 41 per cent. of the total capital of the undertaking. The output was over five million units, and showed an increase of about 62 per cent.

Wrexham.—Increased Prices.—The T.C. has decided to increase the flat-rate charge to 7½d. net, and other rates in proportion.

Quotations.—Quotations were ordered to be obtained for water softeners and an automatic stoker.

TRAMWAY AND RAILWAY NOTES.

Aberdeen.—Year's Working.—The annual accounts for the year ending May 31st, 1919, show a total revenue of £140,901 and a total expenditure of £108,451. The balance was disposed of as follows:—Interest on capital, £2,208; sinking fund, £6,142; depreciation and renewal account, £13,877; special expenditure, £3,386; reserve account, £4,558; for disposal by the Council, £2,279. The total amounts of the sinking, depreciation and renewal, and the reserve funds are respectively £75,316, £197,465, and £61,813. The total number of passengers carried during the year was 41,946,442; the total number of units, 2,950,739; average number of cars in use per day, 80; percentage of working expenses to income, 76·97; average number of passengers per car-mile, 18·94.

Blackpool.—Extensions.—The Bill being promoted in Parliament will be a comprehensive one. In addition to extending the borough by incorporating Thornton, and the construction of sidings at Fleetwood—in connection with the purchase of Fleetwood electric tramroad—it is suggested that the Corporation should apply for general powers to run motor-omnibuses throughout the whole borough, an innovation most useful in assisting the future development of the whole district.

An interesting statement was made at Blackpool Town Council, last week, concerning schemes involving the expenditure of three-quarters of a million of money. The treasurer pointed out that £250,000 would be required for the transfer of the Fleetwood tramways, and the Tramways Committee expected to require £24,000, and the Electricity Committee some £10,000.

Bournemouth.—The question of substituting motor-omnibuses in place of the tramway system was recently discussed by the T.C. Some of the points made at the discussion are reported as follows:—To reconstruct the tramway lines would cost £12,000 per mile. Including the price of rails, the cost of reconstructing 12 miles of track would be £184,000; £60,000 would be required to purchase 20 new tramway-cars, against 45 motor-omnibuses. It costs, at present, twice as much to run a motor-omnibus as it does to run a tramway-car, the respective car-miles being 2s. 2d. and 1s. 1d. The life of an omnibus is five years, and before 'buses could be run in the town the tramway track would have to be removed, at a cost of £230,000, and the roads relaid. This sum is three times greater than the cost of running the tramway-cars last year. Where there are tramways they have already the paying routes.

Bradford.—Year's Working.—The accounts of the Corporation tramway department for the year ended March 31st, 1919, show a revenue of £456,819, an increase of £90,324 on the previous year. The average income per car-mile was 22·26d., compared with 15·89d. Working expenses amounted to £375,074, as compared to £314,998 for the previous year. This shows a gross profit of £119,172, against £87,183 for last year. Total number of units used for traction and car lighting, 11,035,572, against 12,410,819 for previous year; 33 trolley reversers have been installed throughout the system, and are proving very successful in operation. The reserve and renewals fund now stands at £170,204.

Brighouse.—Proposed Extensions.—The T.C. has adopted a proposal of the Huddersfield Corporation to apply for Parliamentary powers to construct a system of tramways from Huddersfield, through Rastrick to the centre of Brighouse, where they will connect with the Halifax system, and *viâ* Bailiff Bridge, with the Bradford service.

Burton.—Accident.—When a Burton and Ashby tramway-car was nearing the top of one of the steepest roads in Burton-on-Trent, on the 8th inst, it began to run backwards. The driver applied the brakes, but the car continued backwards, and, gaining speed, ran down the hill at a great pace. It reached the bottom in safety, but in turning a corner, jumped the rails, and, running across the road, crashed into a hedge and overturned within a few yards of the River Trent. People riding on the top were nearly all injured, but the passengers most badly hurt were riding inside. About 20 people were injured. According to the *Times* the brakes and mechanism of the car were found, on examination, on the 9th inst., to be in order, and the damaged vehicle was driven under its own power to the depôt five miles away.

Colne.—Extensions.—The Tramways Committee contemplates carrying out important developments, including extensions to Earby, over the Yorkshire border.

Continental.—Germany.—An electric locomotive of very high capacity has just been built by the Bergmann electricity works, says the *Technical Review*. It gives 3,000 H.P., and on a very severe test it far exceeded the efficiency stipulated in the contract. The overhead line voltage of 15,000 was stepped down to 350 volts, and 7,000 amperes by an air-cooled transformer.

Belgium.—The *Dernière Heure* announces that the Federation of Belgian Tramway Workers has declared a strike, in view of the delay in satisfying the demands of the staff, leaving to the Provincial Committees the task of deciding the date upon which work shall cease.

The *Soir* states that the employés of the Charleroi tramways have struck for an increase of wages.

Egypt.—Strike.—The Cairo tramway services have been restarted after the strike, which lasted some weeks.

Lancashire.—High Wages.—The recent award of the Court of Arbitration on the wages of tramway employés will mean a considerable increase to Lancashire Corporations. At Oldham the cost will be £4,000; at Rochdale, £3,600; Blackpool, £3,100; Ashton-under-Lyne, £1,000; Salford, £11,000 per year; and Manchester, £20,000. In some cases it is not considered possible still further to increase fares, with the result that the cost will probably involve a loss on the undertakings.

London.—Shoreditch.—An action based on the state of the tramway tracks in London was heard on the 9th inst. in the Shoreditch County Court. A carman, of Rotherhithe, claimed £39 19s. from the L.C.C. for damage to his horse and van. Owing to a depression in the track in Shoreditch High Street, it was stated, the van skidded and was thrown against a motor-lorry, the van and horse being injured. It was stated that there was a 14-ft. stretch of track with a depression half an inch to an inch and an eighth. For the Council it was admitted that the track was bad, although not so bad as had been stated. It was putting the bad tracks in order as quickly as it could in the face of difficulties. It did not object to reasonable damages, but thought it unfair to be asked to turn an old, broken-down, dilapidated van into a new one. Judge Cluer found for the plaintiff for £22 14s. and costs.

Wandsworth.—A fully-laden tramcar took fire on Thursday, last week, in Putney Bridge Road.

Willesden.—A summons for delaying a tramcar has been granted against a Willesden man.

Improved Traffic Conditions.—There are 859 more omnibuses working on the streets than at the date of the Armistice. The speeding up of the underground lines has been responsible for an increase in the daily car-mileage of 44,414 miles, and the London United and the Metropolitan Electric Tramways have added 82 cars to their fleets. The net result of these improvements has been to find seating accommodation for over 1,000,000 more passengers daily.

Accidents.—A City Coroner's jury on the 10th inst. found that, owing to an error of judgment on the part of a L.C.C. tramcar motorman, Wm. McBirney, 68, of Leyton, was fatally crushed between two tramcars in City Road. It appeared that the motorman acted contrary to regulations in backing his tramcar from the front driving platform.

An L.U.T. car jumped the metals in Brentford High Street on Thursday night, last week, and traffic was delayed for some time.

Traffic on the District Railway was interrupted at the busiest hour on Saturday afternoon. The axle of a coach broke while it was standing in Blackfriars Station. The removal of the train caused considerable delay, bookings east of Charing Cross being temporarily suspended.

Manchester.—Rate Relief.—Since the electrification in 1901 of the tramways, £1,326,891 has been available out of profits for relief of local rates.

Meath.—Tramway Electrification.—The T.C. is to borrow £100,000 for the purpose of electrifying the tramway system.

Nelson.—Developments.—The Corporation Tramways Committee has under consideration various improvements and developments of the tramways. It is also reported that it intends supplying electricity to the adjoining borough of Colne.

St. Helens.—Tramway Sale.—According to a statement made by the chairman of the Tramways Committee of the Town Council (Mr. A. Rudd), the Corporation has taken over at a most inopportune time. He says it would have been better to give the late owners a further lease, especially as the terms were very much to the advantage of the Corporation from a financial point of view. At the end of September the Corporation liabilities stood at £80,000 still outstanding on the track, less £9,000 sinking fund and interest, which would be paid off this year, leaving £71,075 sinking fund and interest standing against the undertaking at the time they took it over on October 1st. The overhead equipment stood at £5,138 in March of this year, but before the end of the year that would be entirely cleared off. Thus it meant they would have £71,000 standing against them. As a set-off they had the track. They had a balance of £2,093, but only because they had been unable to do the necessary repairs very much needed on the track, which was in a deplorable condition, in some parts hopeless. In the near future about half the 21 miles over which they operated would have to be relaid. On the dilapidated track and overhead repairs there would be a huge capital expenditure. Before the war cars such as were running in St. Helens cost, when new, from £680 to £800 each. The present-day price of similar vehicles was £2,000 and over, and delivery could not be made for from six to eight months. There was nothing else for it but to arrange with the company for the purchase of the cars now running, and they had purchased 36 for £24,000. They needed considerable repairs, which would cost a lot of money. Eight new cars had been ordered, at a cost of £17,000. Thus they had to face a total of £114,000, and he calculated, before the tramway lines were in good condition, they were going to have something like £200,000 sinking fund and interest against the undertaking. As to income, the tramways must pay for themselves, and he could hold out no promise that the fares would be reduced, whilst if the present fares did not meet costs and expenses, they would be met in a bold way. Mr. Rudd went on to say that they had applied for power to run outside the borough, and link up neighbouring districts with the St. Helens tramway termini. With the exception of the fare on the Haydock-Ashton section, which is increased from 4d. to 5d. for the through journey between St. Helens and Ashton-in-Makerfield, the existing fares and stages of the Tramway Co. will, for the present, remain in force under the Corporation.

The U.S. Tramway Dispute.—The demands of Labour and its defiance of all economic laws are shown by the attempt of the employés of the tramways to have their minimum wage fixed at $2,000 per year, with a proportionate increase for men in positions requiring greater skill. The Commission appointed by the President to investigate the condition of the tramways found that it would be impossible to increase the wages to meet the demands of workers unless the fares were increased, and the effect of increased fares would be to diminish the number of passengers, which would ultimately result either in the bankruptcy of the companies or in their continuing to operate with a reduced number of employés, to the injury of both the employés and the general public. The men replied that fares should be made reasonable by law, and any deficit should be met by taxation.

U.S. Railway Rates.—The Railroad Administration has informed the Railway Executives' Association that it is impossible for the Government to make any general readjustment of rates before January 1st (when the railways are to be returned to private management), but Mr. Hines, the Director-General, suggests that applications for rate increases should be prepared by individual companies. Mr. Hines holds that the poor earnings in the first half of 1919 are an insufficient basis for a demand for a general increase. The traction combinations have already partly disintegrated through their inability to earn rental and other charges while restricted to a five-cent fare. A few unimportant lines have ceased operations altogether, and have been replaced by omnibuses. The receiver of the New York Railways Co. said that the surface roads would probably have to shut down within three months, and the Brooklyn Rapid Transit, which is daily carrying over a million passengers, is finding difficulty in meeting its bills for motive power, which is now supplied only on a day-to-day basis. Local politics are the largest factor in the traction companies' troubles.

York.—New Loan.—The Corporation is recommending the borrowing of £3,200 for land for a new tramcar shed in Piccadilly, and, if required, the borrowing of a sum to be expended on the erection proper.

TELEGRAPH AND TELEPHONE NOTES.

A New Cable.—The cableship *Colonia* arrived at Rio de Janeiro on September 1st, after completing the laying of a new cable from England by way of Ascension, St. Vincent, and Fayal.

Japan.—Announcement is made that the Government will not accept responsibility for any telegram to, or from, or through, Japanese telegraph and cable stations.

Sweden.—The Administration of the Swedish State Telephone system has prepared an estimate for submission to Parliament concerning the expenditure in 1920. The total amounts to £2,857,000, of which the sum of £549,000 is intended for the laying of a cable between Gothenburg and Stockholm, and it is calculated that the requirements in 1921 will also approximate in outlay to that computed for 1920.

It is announced from Stockholm that negotiations are in progress for the formation of a new company, under the title of the Aktiebolaget Svensk Radiotelegraf, to continue certain experiments in wireless telegraphy.

"The Kiss Call."—With such a title as "The Kiss Call," one felt sure that there must be a good joke at the expense of the telephone service in the offing, but it did not come until very nearly the end. But Mr. Huntley's story of the elderly gentleman who died after putting in a trunk call atoned for much. For, unfortunately, the dead man had not made a will, and all the relatives are still quarrelling as to who shall have the call when it comes through.—*The Times.*

The Cableship "Faraday."—The cableship *Faraday*, on August 25th, was loaded at Montreal, Que., with a cargo of grain for a British port. The *Faraday* has been in the cable laying and repairing service continuously during the past 20 years, and has laid a large proportion of the long-distance submarine cables throughout the world. During the late war the *Faraday* was engaged in cable-laying between Ireland and Newfoundland, when she was attended by a British cruiser and a number of patrol boats.—*T. & T. Age.*

United States.—Cablegrams in plain language, English or French, may now be sent to Riga, Russia. The rate from New York is 43 cents per word.

On and after October 1st, the cable rate *viâ* San Francisco and Commercial Pacific Cable, for ordinary cablegrams to Japan, will be reduced by 25 cents per word. The rate from New York will be $1 8 cents per word.

Wireless Telegraphy.—Two young Swedish engineers, MM. Lindenblad and Ekman, are said to have completed the construction of a new system of wireless telegraphy, which, as compared with other systems, shows considerable progress, besides being cheaper.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared.)*

OPEN.

Australia. — Sydney.—December 19th. Metropolitan Board of Water Supply & Sewerage. Centrifugal pumps, electric motors, &c., for the low-level pumping station, Marrickville. Offices of the Board, 341, Pitt Street, Sydney.*

Melbourne. — P.M.G.'s Department. January 20th, 1920. Automatic telephone switchboard at Collingwood. Schedule 1,583. (September 19th.)

December 3rd. Victorian Railways. Portable electric welding set and accessories. Secretary for Railways, Spencer Street, Melbourne.*

Bandon. — October 18th. B. of G. Installation of electric light in workhouse and fever hospital. J. O'Mahony, Clerk of Union, Clerk's Office, Workhouse.

Bolton.—November 11th. Electricity Committee. One 8,000-kw. turbo-alternator, with condensing plant, four water-tube boilers. (See this issue.)

Coventry.—October 28th. B. of G. E.L. installation, London Road Institution. Mr. T. F. Tickner, Architect, 14, Little Park Street.

Egypt. — Alexandria. — November 15th. Egyptian Postal Administration. General stores for 12 months, including several electrical items.*

Glasgow.—October 24th. Parish Council and District Board of Control. Electric lamps. Forms from the Inspector and Clerk, 266, George Street, Glasgow.

Madagascar.—March 1st, 1920. Directeur des Travaux Publics à Tananarive. Installation of generating station, with equipment, at Falls of Volobe, near Tamatave; erection of overhead transmission and distribution lines, and establishment of service in the city. Ministère des Colonies, Paris.

Manchester.—October 31st. Waterworks Committee. One set of electrically-driven, high-pressure, centrifugal pumps. Secretary, Waterworks Offices, Town Hall.

Rhondda.—November 5th. U.D.C. Electricity Department. Two sets of sub-station switchgear. (See this issue.)

York.—October 27th. N.E. Railway. Six or 12 months' supply of telegraph apparatus, telegraph wire and line stores. (See this issue.)

*A copy can be seen at the Inquiry Office of the Department of Overseas Trade (Development and Intelligence), London.

CLOSED.

Australia.—Sydney City Council. Accepted :—

House-service fuses, £706.—Electric Supplies & Engineering Co., Ltd.
Boiler-house plant with chain-grate stokers, £20,4[illegible].—Babcock & Wilcox, Ltd.

P.M.G.'s Department, N.S.W. :—

Material in connection with the installation of impulse-sending devices, £1,155.—Automatic Telephones (Aust.), Ltd.

Victorian State Coal Mine :—

E.L. cable.—7/18, 68s. 6d. per 100 yd.—Lawrence & Hanson Co.; ditto, 7/14, 142s. 6d. per coil.—I.R., G.P. & Telegraph Works Co., Ltd.; 1/16, 24s. 4d. per 100 yd., 7/23, 46/8, 9/20, 80s.—Noyes Bros. (Melb.), Pty., Ltd.
5-amp., one-way, single-pole, tumbler switches, 1s. 10d.; 10-amp., 3s. 9d.—Edison Swan Electrical Co. —*Tenders.*

Melbourne.—For the Dunlop Rubber Co. :—

Motors and equipment, £3,463; switchgear, £331.—Aust. General Elec. Co.
Switchgear, £4[illegible]0 (approx. with additions).—Elec. Equip. Mfg., (Pty.), Ltd. —*Tenders.*

Battersea.—Electricity Committee. Contracts renewed for six months :—

Trinidite, bitumen and joint-box compound.—Dussek Bitumen Co., Ltd.
Electrolytic meters.—Reason Manufacturing Co., Ltd.

For 12 months :—

Cables, &c.—Callender's Cable & Construction Co., Ltd.

Bolton.—Tramways Committee :—

Eight top-covered bogie cars, complete with Brill maximum traction trucks, to include lighting circuits, &c.—English Electric Co.
Two pairs of Brill maximum traction trucks, complete with steel tires, wheels and axles.—English Electric Co.
Ten magnetic brake equipments.—British Westinghouse E. & M. Co., Ltd.

Electricity Committee :—

Rotary converter at Spa Road works.—British Thomson-Houston Co., Ltd.

Hackney.—Public Health Committee. Electric vehicles for removal of house refuse :—

	Capacity. 2 tons.	Capacity. 3½ tons.
R. Garrett & Sons	£1,090	£1,245
General Vehicle Co., Ltd.	1,120	1,310
Ransome, Sims & Jefferies, Ltd.	1,195	1,364
Electromobile Co., Ltd.	1,330	1,390
Edison Accumulators, Ltd.	1,307	1,607

Recommended that the offer of Messrs. Ransome, Sims and Jefferies be accepted for two 2-ton and two 3½-ton electric vehicles for £5,118, provided they are prepared to construct side-tipping arrangement.

Norway.—The Allmanna Svenska Electriska A.B., of Vasteras, Sweden, announces that the company has secured, in competition with international firms, the contract for the electrification of the railway between Christiania and Drammen. The value of the contract exceeds 7,000,000 kronen (£384,000) and the work is to be completed by the end of 1921.

Ramsgate. — T.C. E.L. installation, public library. Mr. E. A. Pinto, £192.

Wolverhampton.—T. C. Accepted :—

One 250-kw. rotary converter, complete with transformer, starting gear, and E.H.T. and L.T. panels, £2,420.—British Westinghouse E. & M. Co., Ltd.
168 Electricity meters, £402.—Bastian Meter Co., Ltd.
Six sets of E.H.T. switchgear, £720.—Ferguson, Pailin & Co., Ltd.
Fitting electric tipping gear to the 3½-ton electric vehicle, £50.—Ransome, Sims & Jefferies, Ltd.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Friday, October 17th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette on "The Manufacture of Collapsible Tubes," by Mr. E. R. Sharpe.
Friday, October 24th. At 39, Victoria Street. At 7.30 p.m. Lecture on "Fire Prevention and Protection in Factories and Workshops," by Capt. S. W. Thorpe (Chief Officer, Kodak Fire Brigade).

Institution of Mechanical Engineers.—Monday, October 20th. At 6 p.m. At the Institution, Storey's Gate, S.W. Graduates' meeting. Paper on "Production," by Mr. C. H. Adams.
Friday, October 24th. At 6 p.m. At the Institution of Civil Engineers, Gt. George Street, W. Address, by the President.

International Shipping, Engineering and Machinery Exhibition.—Open until October 21st. At Olympia, West Kensington, W.

Industrial League and Council.—Tuesday, October 21st. At the Council Chamber, Guildhall, E.C. At 4.30 p.m. Lecture on "Should Wages be Lowered," by Mr. E. J. P. Benn.

Association of Mining Electrical Engineers.—October 24th and 25th. Annual general meeting. At Edinburgh.
London Branch.—October 29th. Ordinary general meeting.

Birmingham and District Electric Club.—Saturday, October 25th. At the Grand Hotel. At 6.30 p.m. Ladies' night.

Manchester Association of Engineers.—Saturday, October 25th. Discussion on "Prices and Conditions for the Supply of Electric Power to Works," to be opened by Mr. J. Frith and Dr. Cramp.

NOTES.

The Shipping, Engineering, and Machinery Exhibition.—It has been decided to keep this Exhibition, at Olympia, open until Tuesday, the 21st inst. Few among the innumerable sufferers from the railway strike, we think, deserve more commiseration than the organisers of the Exhibition, and we are glad to hear that the effects of the strike were in actuality not felt to the extent that might have been expected. Crowds are being attracted daily: visitors who were prevented from travelling during the strike week arrived later in large numbers, and the closing stage of the Exhibition is making up for any slackness that may have been felt in the earlier stage.

Captain Durtnall's paper on the "Electrification of Ships," which was to have been read on October 4th, at a meeting of the Institute of Marine Engineers, was postponed on account of the strike, and will be read on Saturday, October 18th, at 7 p.m.

Inquiries.—Makers of the following articles are asked for :—C.A.Y. Lion electric motor; the "Gunnings" patent time-switch and flasher.

Fuel Economy.—The Coal Controller announces that the restrictions imposed by the Coal and Fuel (Emergency) Order, 1919, which were put in force during the railway strike, restricting all deliveries of coal, coke, and briquettes to 1 cwt. per week, have been removed as from October 11th, and a new Order has been issued allowing deliveries of coal in quantities of 1 ton.

The Batti-Wallah Luncheons.—The opening lunch of the Batti-Wallahs' Society for the winter season is to be held at the Holborn Restaurant on Monday, October 20th. These events take place at the Holborn on the third Monday in the month. On Monday next, Mr. Hugo Hirst will be the guest of the Society, and we understand that after the luncheon he will give a short address on some subject of vital interest to all members of the electrical trade. Members are invited to take with them electrical friends who are not members. The charge for the luncheon tickets is, as before, 5s., and they will be on sale in the Reception Room.

Decimal Coinage.—At a meeting held at the Mansion House, on Tuesday, to discuss the subject of decimal coinage, a resolution supporting the Bill introduced into Parliament by Lord Southwark (the pound-mil system) was carried unanimously.

The I.M.E.A.—Next year's Convention of the Incorporated Municipal Electrical Association is to be held at Bradford during the week commencing June 30th.

The reprint copies of Alderman W. Walker's paper on "The Application of the Whitley Report," read at the last Annual Convention, can be obtained from the Secretary of the I.M.E.A., Electricity Works, Factory Lane, Croydon, at the price of 6d. per copy, postage extra.

New Insulating Material.—A new product suitable for use in electrical insulation is being obtained from the treatment of kelp in Australia, says *Engineering*. The moist precipitate is subjected to pressure and formed under pressure, after which it is hardened by treatment with formalin. The finished article is made by turning on the lathe, a process which is said to be perfectly successful, and a high polish is applied. The raw product is to be found in large quantities round the coast of Australia, and in particular on the Tasmanian shores.

Appointments Vacant.—Shift engineer (£228), for the Watford U.D.C. Electricity Works; stoker (75s.), for the Redditch U.D.C. Electricity Works; shift engineer (97s. 7d.), for the Stalybridge and Hyde Joint Board; cable jointer (46s. + 21s. 6d. + 12½), for the Lancaster Corporation Electricity Department; attendant for suction gas plant, at the Sheffield Waterworks; engineer-in-charge (£300), meter mechanic, and test room assistant (90s.), for the Newport (Mon.) Corporation Electricity Department; cable jointer (82s. 8d.), for the Burnley Corporation Electricity Department; chief draughtsman (£350), automatic shop superintendent (£250), assistant instructor in general machine shop (£225), assistant instructor in electric fitting and switchgear department (£225), for the Loughborough Technical College; overhead linesman (72s. 6d.), for the Burton-on-Trent Electricity and Tramways Departments; relief shift engineer and assistant consumers' engineer, for the Stepney B.C. Electricity Works; cable jointer, for the Bolton Electricity Department; station superintendent (105s. 2d.), for the Colchester Borough Electricity Supply Department; station engineer (£600), temporary assistant engineer (£60 per month), for the Cape Town (S.A.) Corporation Electricity Department. See our advertisement pages to-day.

I.E.E. Wiring Rules.—The wiring rules of the Institution have recently been amended, so as to bring the tables into line with the latest figures published by the British Engineering Standards Association, and to incorporate other modifications. Copies of a fly-leaf containing the amendments can be obtained gratis on application to the Secretary.

The Industrial League Dinner.—The annual dinner of the above League will take at the Connaught Rooms, at 7 p.m., on October 22nd, 1919. Mr. G. H. Roberts, M.P., will preside. We are informed that workmen, shop stewards, foremen, and managers from various parts of the kingdom will be present, and a record gathering is anticipated. The Secretary's address is 66, Victoria Street, S.W.1.

Educational.—Training Ex-Service Men.—The Leith Education Committee has decided to start at the Technical College an Electrical Engineering course for discharged soldiers employed in the winding department of Messrs. Bruce Peebles & Co., Ltd., as learners and improvers. Mr. J. Henderson, A.M.I.E.E., of the design department of the firm, will act as instructor.

University of London, University College.—A course of six lectures on thermionic detectors, oscillators, and amplifiers in telegraphy and telephony will be delivered by Prof. J. A. Fleming, F.R.S., on Wednesdays at 5 p.m., beginning October 29th. The course is open both to members and non-members of the University. Fee, £1 11s. 6d. Application for tickets of admission should be made to Dr. Walter W. Seton, M.A., at University College, London.

University of London.—A very attractive series of University Extension Lectures on "Scientific Discoveries and their Practical Applications to Every-Day Life and Industry" will be given on Monday evenings, at 6.30, at Gresham College, Basinghall Street, E.C., by Prof. John Cox, M.A., LL.D. Last Monday's lecture dealt with The Story of the X-rays; amongst other topics treated in the course may be mentioned—The Motor and the Dynamo, Lord Kelvin and the Atlantic Cables, Long-distance Telephony, Wireless Telegraphy and Telephony, Architectural Acoustics, Stream Lines and Aeroplanes, Sound Ranging, Listening under Water, Directional Wireless, and Radio-activity. The course will be illustrated where necessary by lantern slides, experiments, &c.

Fatality.—William Storrar (19), an apprentice engineer, was fatally crushed between an overhead travelling crane and an upright column at the Naval Construction Works, Dalmuir, Scotland.

Institution and Lecture Notes.—Manchester Association of Engineers.—Mr. H. F. Massey, in his presidential address at Manchester on Saturday, said that he had heard recently of an instance in which production in a foreign country was 600 per cent. higher than in England. This was not the result of brains or muscle, but chiefly of the want of earnest co-operation in this country in developing and setting to work new and improved processes. If hearty co-operation could be established between engineering managers and the workers, the foreign production he had named could be outstripped within a few months, with the result that the workers would get more wages, more men would be employed, and a trade would be re-established in this country which was in danger of passing to foreign lands. There was great reason to fear that in this matter we were being outstripped, not for want of ability or opportunity, but simply for want of harmony. —*The Times.*

Association of Mining Electrical Engineers.—The eleventh annual general meeting of this Association, convened for October 10th and 11th, at Edinburgh, was postponed owing to the railway strike, until October 24th and 25th. The ordinary general meeting of the London Branch is accordingly postponed until October 29th.

Birmingham Electric Club.—A paper was read on Saturday evening, October 11th, by Messrs. Walter and Marsh, on "Private House Installations." The authors gave a large amount of interesting information about the recent designs of small engines, dynamos and storage batteries, with the results of their investigations into relative prime costs, running costs, and efficiencies. They also gave some account of research work done during the war in connection with the improvements in design of storage cells for both mobile and stationary work. It was hoped that the experience gained would be fruitful, and might make possible a great extension of usefulness in quite small lighting sets for the lighting of small houses, &c.

Welfare and First Aid. — The longest chapter in the annual report for 1918 of H.M. Chief Inspector of Factories and Workshops is contributed by Miss A. M. Anderson, H.M. principal lady inspector of factories, on welfare work. This is followed by one on ambulance and first-aid by Mr. J. C. Bridge, F.R.C.S., Ed., H.M. medical inspector of factories, who observes that many of the first-aid boxes seen in factories visited, while fully complying with the letter of requirement, fail to provide the most suitable or convenient dressing. This defect has been observed especially in th case of small dressings, which are generally too bulky and put up in such a way as to make their successful application difficult. The suitability of the ambulance rooms provided in the factories has been found to vary very considerably—many of those recently built leave little to be desired. The Orders have, on the whole, been appreciated. Objections to them have been chiefly against the introduction of the first-aid boxes where an ambulance room is provided. This is almost entirely due to failure to understand the purpose for which they are intended, viz., treatment of minor injuries, and protection against infection in the case of serious accidents requiring treatment in the ambulance room. Generally speaking, the interest taken by the workers in first-aid is considerable, and this only requires to be stimulated.

The International Electrotechnical Commission.—As previously reported, the fourth plenary meeting of the International Electrotechnical Commission will be held in London at the Institution of Civil Engineers, on October 20th to 24th. Eighteen foreign countries will be represented at this meeting by some 35 delegates. This is the first plenary meeting since the outbreak of the war, and is also the first to be held in London since 1906.

The activities of the Commission were inevitably largely suspended on account of the war, and at the forthcoming meeting its future policy will be considered. The importance of international standards is now fully recognised, and the deliberations of this meeting are therefore likely to have considerable influence on the industry in the future.

Whilst this plenary meeting will be principally concerned with the future work of the Commission, one technical point of importance will come up for final ratification. The Special Committee (International) is recommending that 40 deg. C. be adopted for the reference cooling-air temperature for the rating of electrical machinery, this being in agreement with the existing British, American, Italian and French National Standardisation Rules.

At a meeting of the British National Committee, held on October 13th, Sir Richard Glazebrook, C.B., president of the British National Committee, and Mr. Roger T. Smith, president of the I.E.E., were nominated to be the British members of the Council of the I.E.C.

With regard to the future, proposals have been received that the I.E.C. revise the list of terms and definitions which were prepared prior to the war, and issue them as soon as possible. It will also be proposed that terms and definitions for automatic telephones be considered internationally. The delegates appointed by the British National Committee to represent it when the question of nomnclature comes up for discussion are: Dr. Alex. Russell, Mr. A. P. Trotter, Sir William Slingo, Major K. Edgcumbe, and Mr. E .B. Vignoles.

A proposal will be brought forward that the I.E.C. should prepare an international list of graphical symbols. The British Committee has already prepared a list of nearly 200, and these, together with the list of symbols published by the Italians, would form a suitable basis for the work. The delegates appointed by the British Committee are as follows: Dr. Alex. Russell (chairman of British Sub-Committee on Symbols), Mr. A. R. Everest, Capt. J. Slee, R.N., and Mr. A. J. Stubbs.

Prior to the outbreak of war a special Committee of the I.E.C. commenced the preparation of a report on the Nomenclature of Steam Turbines for Electrical Plant, and it will be proposed that this work be continued. The following British delegates have been appointed to deal with this subject: Capt. H. Riall Sankey (chairman of British Sub-Committee on Prime Movers for Electrical Plant), Prof. Gerald Stoney, Mr. F. Samuelson, and Mr. P. V. Hunter.

The proposal received from the French Committee that standards for screw lamp caps and sockets be prepared will be discussed. It is understood that the British Committee is in favour of this proposal, and has nominated the following delegates to deal with this question: Messrs. C. H. Wordingham (chairman of British Sub-Committee on Electrical Accessories), F. M. Chapman, S. W. Attwell, S. H. Callow, and J. E. Edgecombe.

The question of standard pressures for distribution and insulators having been raised by some of the foreign committees, the following delegates have been appointed and instructed by the British National Committee with regard to this: Sir Richard Glazebrook, C.B. (chairman of British National Committee), Messrs. C. P. Sparks (vice-chairman of British National Committee), A. R. Everest (British delegate to Special Committee on Rating), C. H. Wordingham (chairman of British Sub-Committee on Electric Control Gear), and W. B. Woodhouse (chairman, British Sub-Committee on Overhead Transmission-line Material).

It has been agreed to co-operate in the preparation of an international standard for resistance of aluminium. It will be recalled that the standard of resistance for copper was internationally agreed and the value issued by the I.E.C. in 1914.

State Aid for Apprentices.—The Training Department of the Ministry of Labour notifies a new regulation in connection with the scheme under which, by agreement with various industries, State assistance is given to apprentices who have served in the war on returning to complete their apprenticeships. It is now provided, in the case of schemes approved on or before September 1st, that where an apprentice has resumed his training on or before September 1st, an application to come under the scheme must be made before November 1st; or where an apprentice has resumed his training after September 1st, an application to come under the scheme must be made within two months of his resuming his training; or in the case of schemes approved after September 1st, where an apprentice has resumed his training on or before the date of issue of the scheme, an application to come under the scheme must be made within two months of such date of issue; or where an apprentice has resumed his training after the date of issue of the scheme, an application to come under the scheme must be made within two months of his resuming training; otherwise retrospective payment of the amount of State assistance cannot be claimed for a longer period than two months in each case. Schemes have now been issued in 33 trades, and particulars can be obtained at any Employment Exchange.

The Question of Nationalisation.—The Premier showed by certain sentences in his speech at the Mansion House on October 7th that the Government was fully alive to the fact that the subject of nationalisation was one of the next around which controversy would rage. He said that the British community must make it clear that it meant to deal justly and fairly with the claims of all classes. "A man's property, whatever form it takes, whether it takes the form of land, or buildings, or labour, if the community needs it, it must pay a fair price for it." These sentiments represent true British traditions, and in these of all days it is along such lines and such lines alone that economic stability can be secured. If there is to be any nationalisation of anything, whether it be of railways, of mines, or of electricity supply, the principles of British fairness must be strictly followed, and it is essential that this very simple code of morality should receive proper recognition before the nation settles down in earnest to discuss the pros and cons of nationalisation as a question of practical politics. We recognise that there is a considerable part of the community which adopts nationalisation as an industrial ideal of the achievement of which it is prepared to labour, and, if need be, to fight, with all the zeal and strength of a religious enthusiast. From what we have heard from the lips of labour orators on this part of their religion we gather that they look upon nationalisation of certain services as the one grand means by which they can obtain amelioration for the masses from most of the shortcomings under which they exist. By taking over the railways, the mines, and so forth, and operating them under State ownership, there are to be better wages, shorter hours, better houses, happier conditions, and all those other things which we all want everybody to have. Now if we go in for confiscation of anything we shall shake the whole financial organisation, and produce such a state of chaos that the last state of everybody will inevitably be worse than the first. The nation would become bankrupt, and most of us would be in poverty and misery. If, on the other hand, we follow the course which high British tradition dictates, and which the Premier declares to be essential, we have to buy these services at a fair and just price. On such purchase price we have to pay interest at any rate at a figure no lower than that paid on present Government loans. We have to provide for new and experimental work and all sorts of other contingencies from the available revenues of these undertakings, and after we have done all this, what remains would be available for carrying into effect our very worthy desires respecting better wages, conditions, and so forth. It is, we believe, the argument that if the services were thus transferred the worker would be inclined to work harder and would produce more, or would give a better service in some form or other, so that the revenue of mines and railways would rise, and the price of coal now so burdensome to the community and so restrictive for industry would fall. The worker would then welcome scientific and other improvements which would ensure better results. At present he may be disinclined to help to do anything that will add to the wealth of his masters, but nationalisation would make him a partner in the business, and he would do all things to secure for himself as a member of the community a successful business. The question of nationalisation promises to become one of the great subjects with which we shall have to concern ourselves as an entire people. It is obvious from the published reports of the reply of Mr. Lloyd George to the deputation from the Trades Union Congress Parliamentary Committee and the Executive of the Miners' Federation of Great Britain, that it is not the intention of the present Government to adopt as its policy nationalisation of the mines. We hope to refer to the principal points raised, in a later issue, but at the moment space compels us to content ourselves with recording the fact that the Government decision is definite, and that if the demands of those represented by the miners are persisted in and developed, the public will be asked to vote its will in the matter at a general election. It is announced that Labour interests are developing a widespread propaganda movement in favour of nationalisation. If that be so, in our opinion nothing is more essential in the interests of the stability of industry than the equally widespread publication of the very important arguments that are to be adduced against it. The reported discussion exposes the weakness in the nationalisation advocacy.

Legal.—A. & A. Electrical Co., Ltd. *v.* the Lighting Accessories Co. and Julius Boehm.—On Tuesday, in the King's Bench Division, Mr. Justice Lush, sitting without a jury, had before him an action brought by the A. & A. Electrical Co., Ltd., of Westminster, against the Lighting Accessories Co. and Julius Boehm, of Butler Street, Moor Lane, E.C. There were two actions originally, but they had been consolidated by order of the Court. In the first plaintiffs claimed the repayment of a sum of about £500 in respect of a dishonoured cheque and bills of exchange in part payment of contracts between the parties for the supply to the defendants of a large number of electric batteries, lamps, and torches. The second action was in respect of bills of exchange for £273 8s. 4d., dated May, 1918, drawn by the plaintiffs and accepted by the defendants. Plaintiffs alleged that the defendants, through Boehm, guaranteed due payment of the sums owing. The defendants said that the bills of exchange and cheque were given for the contracts in 1918 for the supply of the goods, but the goods were bought by defendants by description. They alleged there had been a breach of warranty, and counterclaimed for damages.

Mr. Lewis Thomas, K.C., and Mr. Harold Brandon appeared for the plaintiffs, and Mr. J. R. Randolph, K.C., and Mr. A. E. Woodgate for defendants.

After hearing the evidence his Lordship said there was not a shadow of a defence to the action. The contracts were perfectly clear under two letters of April 17th and of June 11th. There was no misrepresentation, and there must be judgment for plaintiffs for the amount claimed and costs. Judgment was entered for £814 odd and costs.

Trade Union Fusion.—October 10th was the last day for sending in the ballot papers on the proposed amalgamation of engineering Trade Unions into one body, to be known as the Amalgamated Engineering Union. All the papers have to be forwarded to the London headquarters of the Amalgamated Society of Engineers. The scheme embraces fifteen engineering unions, with a membership of approximately half a million and accumualted funds of something like £4,000,000. Mass meetings have been in progress all over the country, and opinion generally has been favourable to the scheme. A meeting of the E.T.U. (London district) discussed the proposed amalgamation on September 18th, and it was stated that a ballot of members would be taken by post. Representatives of the shipbuilding and engineering trades and of the Amalgamated Society of Engineers have been invited to meet Sir Robert Horne this week to discuss the subject of the consolidation of war wages and bonuses.

Mr. Tom Mann has been elected secretary to the Amalgamated Society of Engineers. His predecessor, Mr. R Young, had to retire owing to his election to Parliament.

OUR PERSONAL COLUMN.

The Editors invite electrital engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central Station and Tramway Officials.—Thirty-five applications were received for the post of manager of the section of the Tees-side Tramways in the Stockton and Thornaby area, and six candidates were selected for interview.

Hackney B.C. Electricity Committee recommends that the salary of Mr. L. L. Robinson, borough electrical engineer, be increased as from April 1st, 1920, from £750 to £1,050 per annum, with increments of £50 per annum on each succeeding April 1st, to a maximum of £1,200 per annum, and that the amount of such annual salary be inclusive of any amount given as "war bonus," "war wage," or other grant now made or which may subsequently be made under any award or order or resolution of the Council.

Mr. S. B. Windle, chief assistant in the Sunderland Corporation electricity department, has been unanimously appointed electrical engineer to the Doncaster Corporation, at a salary of £550 per annum. There were 90 applicants for the post. Mr. Windle went to Sunderland from Manchester in 1903 to be chief assistant in the mains department. He has been chief assistant to the electrical engineer (Mr. A. S. Blackman) since 1907. He will take up his new appointment about the end of this year.

Mr. G. H. Browne, A.M.I.E.E., has declined the position of electrical engineer to Dartford U.D.C. at £500 per annum.

General.—At a luncheon given at the Engineers' Club, New York, in his honour by prominent men of the electrical fraternity representing the Society for Electrical Development, Mr. E. N. Hurley was presented with an engrossed parchment testimonial expressing appreciation of his work while head of the United States Shipping Board. The presentation was made by Mr. J. M. Wakeman, general manager of the society. Mr. Hurley, in responding, said that he resigned his job with the Shipping Board in order to get back to the electrical business, and he had spent some six weeks investigating what had been going on since he left it to take up governmental work. He was astounded at what had been done. He thought the whole electrical industry could well take to heart this message: "Hold up your head and be of service." That was the thing the electrical industry existed for—to be of service.

Sir Evan Jones, Bart., M.P., who consented to accept the position of Controller of Coal Mines for a limited period, at the urgent request of the President of the Board of Trade, resigned the position as from October 8th.

Sir George Touche has been elected chairman of the Anglo-Argentine Tramways Co., Ltd., to fill the vacancy caused by the death of Mr. J. B. Concanon.

Sergeant-Major A. G. Hammersley, R.A.O.C., who was previously an engineer at the Stafford works of Siemens Bros., has been awarded the Meritorious Service Medal in recognition of valuable services in Mesopotamia.

Mr. C. G. Abbey, late of Messrs. Kelsall & Parsons, Glasgow, joined Messrs. Fraser & Borthwick, Glasgow, on October 1st as manager of their electrical supply department.

Mr. W. W. Blunt is retiring from his post of director of the Metropolitan-Vickers Electrical Co., Ltd., to take up an active partnership in an engineering business with his brother in the United States. To mark the occasion his colleagues from Trafford Park and the district offices met at dinner at the Midland Hotel, Manchester, on October 10th to honour Mr. Blunt and wish him the best of luck. The company was 150 strong. Captain R. S. Hilton, managing director of the company, was in the chair, and following the toast of "The King," he proposed the health of Mr. Blunt. He said that the function had been labelled as a farewell dinner, but he quarrelled with that title. It was a source of gratification to know that Mr. Blunt retained a connection with the old company and would represent it in an important position where he would help to build up, and tightly cement, the *entente cordiale* between not only the British Co. and the American Co., but between the British nation and the American nation. There could be no better ambassador. Mr. Blunt had been 23 years with the company; the history of the old British Westinghouse Co. was the history of Mr. Blunt. For years he had been head of the commercial organisation of the company, and he had trained a good many of the staff. Musical honours and very considerable acclamation were awarded Mr. Blunt at this stage of the proceedings. In handing to Mr. Blunt the silver coffee service and flask which had been subscribed for by his colleagues, Mr. P. N. Rand added to Captain Hilton's eulogy of the guest. He also handed to Mr. Blunt, for Mrs. Blunt, a diamond brooch. In his reply, Mr. Blunt stated that he could not possibly express his gratitude. Mr. Blunt said that he had been largely dependent upon his own exertions, but none had had such loyal and grand support as had been given to him by the whole organisation of the old British Westinghouse Co. This was due to the wonderful staff. He predicted a brilliant future for the new Metropolitan-Vickers Electrical Co., Ltd. This company had the opportunity of playing a tremendous part in the development of both national and individual interests. Mr. H. Mensforth, C.B.E., proposed the toast of the United States of America, and coupled thereto the names of Mr. J. C. Whitmoyer and Mr. O. H. Baldwin. Mr. Mensforth said that he had been in America during the last few weeks, and had very pleasant recollections of the treatment which had been given him there. The closer the co-ordination of American and British interests the better for the civilisation of the whole world. The ideals of the countries were exactly the same. Messrs. Whitmoyer and Baldwin replied, after which Mr. J. H. Tearle toasted "The Chairman." Musical items given by several members of the Metropolitan-Vickers staff interspersed the speeches, and the function closed with the singing of Auld Lang Syne and the National Anthem.

Lieutenant A. McDougall, M.B.E., R.E., A.M.I.E.E., A.M.I.Mech.E., has now been demobilised, and is proceeding to India to take up an important appointment with the Delhi Electric Tramways and Supply Co. In 1914, before enlistment, he was employed on the outside electrical department of the N.E. Railway.

Roll of Honour.—The death is officially notified of Private W. E. Nuttall, aged 21, Loyal North Lancashire Regt., reported missing in March, 1918, who was previously employed by Messrs. Dick, Kerr & Co., Ltd., Preston.

Obituary.—Mr. S. F. Jeffery.—The death has occurred, following the amputation of a leg, of Mr. S. E. Jeffery, who had for the past five years been on the electrical staff at the Crayford works of Vickers, Ltd. He was 63 years of age, and took an active part in the inauguration of the first electric tramway at West Ham. Later he was in business in London as an electrical engineer.

Will.—The late Mr. Albert Vickers, chairman of Vickers, Ltd., left £886,584 gross and £759,747 net personalty.

CITY NOTES.

Brotherton Ediswan Tubes & Conduits, Ltd.

At an extraordinary general meeting of Brotherton Tubes & Conduits, Ltd., held on 9th inst., at Wolverhampton, Mr. Hargreaves presiding, it was decided to change the name of the company to the "Brotherton Ediswan Tubes & Conduits, Ltd. According to a report on the matter in the *Birmingham Post*, the conditional agreement made between the company and the Edison Swan Electric Co., Ltd., was also approved, and it was decided to increase the capital of the company from £13,000 divided into 65,000 shares of 4s. each, to £51,000 divided into 130,000 shares of 4s. each and 25,000 cumulative participating preference shares of £1 each by the issue of 65,000 further shares of 4s. each (such shares, and also the existing 65,000 shares of 4s. each, to be called ordinary shares) and 25,000 cumulative participating preference shares of £1 each; that the further 65,000 ordinary shares to be issued shall rank, as regards capital, dividends, voting powers, and in all other respects *pari passu* with the existing shares in the company, and shall be issued to such persons or corporations whether existing members of the company or not, and whether at premium or otherwise, and generally upon such terms and conditions as to issue and allotment as the directors of the company shall determine. The chairman said favourable relations had existed for some time with the Edison Swan Electric Co., and these had culminated in a satisfactory agreement between the two companies, the Edison Co. agreeing to take up the 25,000 cumulative participating preference shares of £1 each, and pay for them in full in cash at par within thirty days of the Brotherton Co. passing a resolution authorising such increase of capital as above mentioned. Two of the Edison Co. directors would join the board of the company. From a business point of view they gained a considerable advantage from the agreement. The whole of the resolutions before the meeting were passed.

New Issues.—There are being offered on behalf of Messrs. Vickers, Ltd., £1,803,300 8 per cent. Chinese Government Treasury notes, 1925/1929, at 98 per cent. Preferential consideration will be given to applications from shareholders in Vickers, Ltd. The notes are being issued to Vickers, Ltd., by the Chinese Government pursuant to an agreement under which the company are to supply commercial aeroplanes and to build the necessary aerodromes, hangars, &c.

Ruston & Hornsbys, Ltd.—The list closes on or before tomorrow, Saturday, in an issue of 818,568 ordinary shares of £1 each. In addition to Ruston Proctor's and Richard Hornsby's the combination includes Ransomes, Sims & Jefferies, in which the company holds all the ordinary shares. The issue is for the purpose of providing additional working capital to meet the growing needs of the business.

Anglo-American Telegraph Co., Ltd.—Interim dividend for quarter ended September 30th of 15s. per cent. on the ordinary stock and 30s. per cent. on the preferred stock, less tax.

Brisbane Electric Tramways Investment Co., Ltd.—Interim dividend of 8 per cent. per annum (4s. per share), free of tax, on the ordinary shares for the half-year.

Cape Town Consolidated Tramways & Land Co., Ltd.—According to the *Financial Times*, the accounts for the year 1918 show a loss of £622, which increases the debit balance to be carried forward to £12,607.

Stock Exchange Notices.—The Committee has specially allowed dealings in the following securities under Temporary Regulation 4 (3):

Aladdin Renew Electric Lamp Corporation.—80,000 7 per cent. cumulative participating preference shares of £1 each, 10s. paid, Nos. 1 to 80,000.

Rapid Submersible Ship Cleaner.—100,000 shares of £1 each, 10s. paid, Nos. 8 to 100,007.

Application has been made to the committee to allow the following to be officially quoted:—

Midland Electric Corporation for Power Distribution, Ltd.—40,000 4 per cent. cumulative preference shares of £5 each, fully paid.

Hurst, Nelson & Co., Ltd.—According to the "Times," the directors propose to capitalise a large portion of the general reserve fund, which amounts to £110,000. They recommend that the capital be increased to £400,000 by the creation of 80,000 new ordinary shares of £1 each.

Siemens Bros. & Co., Ltd.—Interim dividend at the rate of 10 per cent. per annum, free of tax.

Oriental Telephone and Electric Co., Ltd.—Interim dividends of 3 per cent. on the 6 per cent. cumulative preference shares, less tax, and of 4 per cent. on the ordinary shares, free of tax.

Westminster Electric Supply Corporation, Ltd.—The fully-paid share certificates of the new issue of ordinary shares are now ready, and can be exchanged for allotment letters and bankers' receipts at the offices of the corporation.

Babcock & Wilcox, Ltd.—Interim dividend at the rate of 12 per cent. per annum, free of tax, on the ordinary shares for the half-year.

Anglo-Portuguese Telephone Co., Ltd.—Interim dividend of 3 per cent., less tax.

STOCKS AND SHARES.

Tuesday Evening.

Stock Exchange markets throb with business and hum with cheerfulness. Pessimists may prate of the possibility of more strikes occurring next February, but, in any case, that is in 1920, while we are now in 1919, and profits made from oil are being magnified in the South African boomlet. Nor can the investment departments complain of entire neglect, for there is a steady demand that absorbs Home Railway debenture and prior-charge stocks, despite the reluctance of the public to pay much heed to the ordinary stocks in this section.

Adelaide Electric new 5 per cent. tax-free preference shares can be bought at 20s., and carry a full dividend payable next March. Five per cent. free of tax at 6s. in the pound is equal to nearly 7¼ per cent. gross. British Electric Traction 6 per cent. cumulative preference can be picked up at 75½, and yields 8 per cent. on the money. The stock ranks for an additional 2 per cent. after the ordinary has received 8 per cent., which seems a long way off. The ordinary advanced on Monday to 41. Potteries Electric Traction 5 per cent. cumulative preference give 7 per cent. at 14s. 6d. The shares rank *pari passu* with the ordinary as regards capital, and the latter have hardened to 14s. this week. The 4½ per cent. debenture gained 5 at 72½. Tramways (M.E.T.) Omnibus 7 per cent. preference are better at 20s. 3d., at which the return comes to the full 7 per cent., allowing for the dividend payment in December. Crompton 7 per cent. non-cumulative preference at 24s. (dividends January and July) afford 8¼ per cent. on the basis of the 10 per cent. paid for the year ended last March. The shares rank *pari passu* with the ordinary after the latter have received 7 per cent.

In the debenture list, English Electric 5½ per cent. Sinking Fund first mortgage debentures, which came out at 94, can be bought at 91¾, with a full interest payment in January. The price gives a yield of 6 per cent. on the money without taking redemption into account. A cumulative sinking fund of 2½ per cent. comes into operation next year for the purchase or drawing (at 102) of the bonds, the whole of which will thereby be extinguished by 1940. Edmundson's 4½ per cent. first mortgage debenture stock is on offer in a small way at 71, and pays £6 6s. 6d., with interest due on January 15 and July 15. This is redeemable any time at 105, and a sinking fund of one per cent. began in 1912, the proceeds of which are applied in purchase of the stock.

From these few representative examples, as will as from the tables set out here every week, it may be seen that the investor can secure good securities and reasonable yields from a fairly wide selection of companies engaged in the electrical industry.

That the incidence of a 6s. income-tax bears heavily upon corporations and individuals alike can be gathered from the fact that some of the former, which have been in the habit of paying their dividends tax free, are now announcing a change in this respect. The Stock Exchange itself is amongst this number. That the cable undertakings may follow suit is regarded as unlikely, and the prices in this market maintain their strength. Marconis are swinging to and fro widely. Hopes of a new issue at a low price animate the firmness of the parent shares, but despite the rumours regarding favourable deals in the cases of the American and Canadian companies, the prices at 32s. 6d. and 16s. 9d. respectively are below their recent best levels.

In the electricity supply market, rises have occured in Charing Cross ordinary, County ordinary, Metropolitans and Westminsters, the only fall being one of 5s. in City of London ordinary. The list generally presents a good deal of strength. The question was raised the other day in the market as to whether, having regard to the coal shortage, oil could not be substituted as a fuel in the electrical world. Already efforts have been made to provide a "synthetic" oil at a cheaper cost than that of the natural product, and, although these efforts are regarded with interest more academic than practical at present, they have evoked a good deal of attention. It is asked whether the electrical companies could not free themselves from the shackles imposed by the coal position by substituting oil, a matter which must be dealt with by more practical hands than those writing this letter.

General Electric preference have hardened again to 20s. 6d., but in the list of manufacturing shares as a whole, there is not much change. The railway stocks are weaker. Amongst foreign traction varieties, Anglo-Argentines are a distinctly better market. The principal feature is a rise of 3 points in Brazilian Tractions to 61, in company with most of the other securities connected with the Republic which have advanced in consequence of the movements of the rate of exchange. Mexicans continue very heavy, further falls occurring in Mexican Light and Power and Mexico Tramway bonds. Rio Tramway bonds are rather better.

Engineering shares keep steady, and a better tone has supervened amongst rubbers, owing to an improvement in the price of the raw material. There is a good tone also in the armament market, where Vickers and Armstrongs have both improved. Commercial issues as a whole are in noticeable favour, and, in spite of the competition from the oil and Kaffir markets, the man in the street is putting a good deal of money into shares of the steadier order.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1917.	Dividend 1918.	Price Oct. 14, 1919.	Rise or fall.	Yield p.c.
Home Electricity Companies.					
Brompton Ordinary	10	8	6	—	£6 13 4
Charing Cross Ordinary	4	4	2⅞	+ ⅛	6 19 2
do. do. do. 4½ Pref.	4½	4½	8	—	7 10 0
Chelsea	5	5	8	—	5 0 0
City of London	8	8	11½	— ½	7 2 8
do. do. 6 per cent. Pref.	6	6	9⅛	— /	6 11 9
County of London	7	7	9⅞	+ ⅛	7 5 5
do. do. 6 per cent. Pref.	6	6	9⅛	—	6 11 9
Kensington Ordinary	7	6	4½	—	6 6 4
London Electric	Nil	Nil	1½	—	Nil
do. do. 6 per cent. Pref.	5	6	8½	—	8 11 6
Metropolitan	4	5	8½	+ ⅛	8 0 0
do. 4½ per cent. Pref.	4½	4½	8⅛	—	7 1 2
St. James' and Pall Mall	9	10	6⅛	—	8 3 4
South London	5	5	9½	—	7 8 6
South Metropolitan Pref.	7	7	1	—	7 0 0
Westminster Ordinary	9	8	7⅞	+ ½	7 8 9
Telegraphs and Telephones.					
Anglo-Am. Tel. Pref.	6	6	96	—	6 5 0
do. Def.	1½	33/6	22½	—	7 9 0
Chile Telephone	8	8	6⅞	—	6 18 6
Cuba Sub. Ord.	7	7	10½	—	*6 18 4
Eastern Extension	8	8	15⅝	— ⅛	*5 1 7
Eastern Tel. Ord.	8	8	160⅜	+1	*4 19 8
Globe Tel. and T. Ord.	7	8	15½	+ ⅛	*5 4 0
do. do. Pref.	6	6	10½	—	5 17 1
Great Northern Tel.	22	22	39	—	7 11 9
Indo-European	13	14	47½	—	6 16 10
Marconi	20	25	5⅛	—	4 4 9
Oriental Telephone Ord.	15	10	2⅛	—	4 11 9
United R. Plate Tel.	8	8	7⅛	—	*5 1 7
West India and Panama	1/3	1/3	1/6	—	*4 16 8
Western Telegraph	8	8	16½	—	*4 18 6
Home Rails.					
Central London Ord. Assented	4	4	80½	—	5 13 1
Metropolitan	1	42	25	— ½	5 0 0
do. District	Nil	Nil	21½	— 9	Nil
Underground Electric Ordinary	Nil	Nil	9⅞	—	Nil
do. do. "A"	Nil	Nil	8/-	—	Nil
do. do. Income	4	5	94	+1½	*5 6 5
Foreign Trams, &c.					
Adelaide Sup. 6 per cent. Pref.	6	6	4½	—	6 13 4
Anglo-Arg. Trams. First Pref.	5½	Nil	3⅛	+ ⅛	—
do. do. 2nd Pref.	—	—	2½	+ ⅛	—
do. do. 5 Deb.	5	5	65	+ ½	7 14 6
Brazil Tractions	—	—	61	+3	—
Bombay Electric Pref.	6	6	12½	—	4 18 0
British Columbia Elec. Rly. Pfce.	5	5	56⅜	—	8 17 0
do. do. Preferred	Nil	2½	48⅜	—	5 7 0
do. do. Deferred	Nil	Nil	30⅛	—	Nil
do. do. Deb.	4½	4½	61	—	7 6 7
Mexico Trams 5 per cent. Bonds	Nil	Nil	30	—	Nil
do. 6 per cent. Bonds	Nil	Nil	40½	—2	Nil
Mexican Light Common	Nil	Nil	82½	—	Nil
do. Pref.	Nil	Nil	45½	—3	Nil
do. 1st Bonds	Nil	Nil	59⅜	—	—
Manufacturing Companies.					
Babcock & Wilcox	15	15	8½	—	*4 16 0
British Aluminium Ord.	10	10	1½	—	5 18 4
British Insulated Ord.	25	12½	2⅛	—	5 19 4
Callenders	25	25	8½	—	7 2 10
do. 6½ Pref.	5	6½	3⅜	—	6 6 10
Castner-Kellner	25	20	2½	—	8 0 0
Crompton Ord.	7	10	21/6	—	9 6 0
Edison-Swan, "A"	—	—	1⅛	— 1/16	6 2 0
do. do. 5 per cent. Deb.	4	5	81½	—	6 2 9
Electric Construction	10	10	1½	—	8 18 0
Gen. Elec. Pref.	6	6½	20/3	+6d.	6 6 10
do. Ord.	10	10	2	—	*5 0 0
Henley	25	25	2½	—	8 11 1
do. 4½ Pref.	4½	4½	6⅜	—	6 4 2
India-Rubber	10	10	17	—	*5 17 8
Met.-Vickers Pref.	—	—	3⅛	— 1/16	5 2 5
Siemens Ord.	—	10	1⅜	—	*7 5 4
Telegraph Con.	20	20	25	—	*4 17 0

* Dividends paid free of Income Tax.

THE LONDON UNDERGROUND RAILWAYS.

Whilst the labours of the Select Committee on Transport (Metropolitan Area) are now a thing of the past, no apology is needed for putting on record in our pages a condensed summary of the evidence given in June last by Mr. Frank Pick, commercial manager to the Metropolitan District, London Electric Railway, &c., on behalf of what is known as the Underground group of companies. In Mr. Pick's opinion (the following abstract of whose evidence is taken from the *Railway Gazette*) when the criticism which led to the late inquiry was analysed it would be found to come down to a question of rolling stock. Table I shows the number of passengers for which this group of companies had been directly responsible for the period (1908-1918) during which it had been in effective existence.

TABLE I.

Year.	Total passengers carried by the group.	Average receipt per passenger.	Total share and loan capital outstanding.	Average rate of interest or dividend paid out of revenue.
	Approximate.	d.	£	Per cent.
1908	147,000,000	1·78	27,970,491	1·62
1909	162,000,000	1·75	29,080,047	2·02
1910	166,000,000	1·73	29,751,598	2·28
1911	183,000,000	1·72	29,912,284	2·51
1912	*468,000,000	1·50	33,486,434	3·18
1913	†812,000,000	1·47	41,232,472	3·18
				War.
1914	797,000,000	1·48	43,193,442	3·05
1915	769,000,000	1·53	43,476,585	3·21
1916	818,000,000	1·54	43,490,501	3·23
1917	832,000,000	1·68	43,499,678	3·29
1918	901,000,000	1·83	43,483,039	3·59

* The London General Omnibus Co., Ltd., included in the group from June 21st, 1912.

† The City and South London and Central London Railways included in the group from January 1st, 1913.

The deep-level tube railways (except the City and South London) were not working services of trains up to their maximum track capacity. The Hampstead section was working a maximum number of trains, but not a maximum number of cars on each train. The improvement in the services given on these railways was solely dependent on the provision of new rolling-stock. The Metropolitan District Railway was in a difficult position with regard to rolling-stock; two-thirds of the stock had been in hard service since 1905, and measured in miles run it represented over 600,000 miles per car to date. Added to this there was the extra strain thrown on the rolling-stock by the overloading which was now almost constant.

The rolling-stock under the control of the company consisted of 535 cars; the traffic schedules called for 450, or 84 per cent. It had not been possible to keep up the full number of cars required for the traffic schedules. The average daily number of cars put into service this year was: January, 416; February, 405; March, 411; April, 409; May, 406; June, first week, 425. The result shown by these figures was solely due to war conditions. The total number of workmen who had left since the outbreak of war was 835; the total number of men and women put on during the war period was 725, and since the armistice, 210. Of the original staff only 157 remained throughout. As much of the labour was specially skilled, the effect of this turnover upon the efficiency of the shops might be easily appreciated. The deficiency, upon the making good of which all the rest of the work depended, was in skilled armature winders accustomed to heavy traction armatures. There seemed to be a real shortage in this particular grade of labour. The volume of work to be performed in the shops had actually increased by reason of the new standards of maintenance forced upon the company by the war. For instance, rails used to be removed from the track with an unevenness of surface of 3-32 in. Owing to the shortage of rails it became necessary to retain them in the track until the unevenness reached 5-32 in. There was greater vibration, but not less safety. This reacted upon the tires; instead of running 40,000 miles for one turning, they ran only 28,000 miles, and the wheel lathes had almost double work to get through. This was but an isolated example of the sort of interaction which the forced economies of the war produced.

The complete renewal of the rolling-stock, for which a programme had been prepared, had to be held up entirely during the war and could not be resumed until the quantity of rolling-stock available for service had been first increased to a point at which it would be able to cope with the passengers to be carried.

It was not possible to set out all the services which the group had rendered to the Government during the last five years. Only those facts were set out which had a bearing upon the present congestion of passenger traffic in London. The Underground group had done nothing to create this congestion and had left undone nothing to alleviate it; the best had been done with the physical capacity of the undertakings for transport. As the present position of the companies was due wholly to war causes, and, in particular, to the direct action of the Government in withdrawing traffic facilities under the urgent and overriding needs of the war, they had a moral claim to a fair opportunity to reinstate themselves up to the pre-war level of operations without interference.

Present Traffic Problem.

Previous to the outbreak of war it was possible to obtain a measure of the London traffic problem in the reports issued yearly by the London Traffic Branch of the Board of Trade. During the war these reports were discontinued.

The observations which seemed called for from an inspection of a careful estimate based on the available data were:—

(*a*) While the course of the war checked the growth of travel until 1917 there had been a growth above the normal rate in 1918, and there was every indication that this high rate of growth was continuing in 1919.

(*b*) There had been a shift in traffic from omnibuses to tramways and railways during the war, particularly to railways. The omnibus traffic between 1913 and 1918 declined by 7 per cent., due to absence of facilities, while in the same period tramway traffic increased by 22 per cent. and railway traffic by 52 per cent.

(*c*) If the population of Greater London had continued to increase at the same rate as in the years prior to the war, the journeys per head of the population would have risen from 271 in 1913 to 306 in 1918. But as there were several indications that the resident population of Greater London had remained approximately constant from 1914 until 1918, it was probable that the journeys per head of the population had now risen to 321 or by 50 more per head since 1913, which again was abnormal.

(*d*) If all forms of local travel were brought into account, the journeys per head of the population had reached a total of approximately 375 or close up to the present record for Greater New York.

In 1913 the number of passengers carried by the railways of the Underground group was 232,234,332. Taking this figure as 100 per cent. standard, the numbers carried in subsequent years were:—1914, 98 per cent.; 1915, 110 per cent.; 1916, 123 per cent.; 1917, 146 per cent.; 1918 (379,438,072), 162 per cent. The omnibuses carried 604,133,215 passengers in 1913, and in 1914, 96 per cent.; 1915, 85 per cent.; 1916, 88 per cent.; 1917, 82 per cent.; and 1918 (521,380,247), 86 per cent.

Upon these figures it might be observed:—

(*a*) That from 1913 to 1918 the railways had to meet an increase in the volume of traffic of 147,000,000, or 63 per cent. This might be compared with the period from 1908 to 1913. In the latter period the railways, which, by contrast with the static conditions prevailing during the war, were in a progressive state, had to deal with an increase of only 44,000,000, or 19 per cent.

(*b*) That from 1913 to 1918 the omnibuses comprised in the Underground group experienced a loss of passengers amounting to 83,000,000, or 14 per cent. In the previous period from 1908 to 1913, which covered the development of the motor omnibus in London, there had been an increase of 394,000,000 of passengers, or 116 per cent.

(*c*) That the withdrawal of omnibus facilities converted omnibus passengers into railway passengers, and so created the congestion. The transfer was estimated at 60,000,000 passengers.

(*d*) That the startling growth in the traffic did not manifest itself until the autumn of 1917, and was then continued in 1918.

The growth of traffic of 1918 was being surpassed in 1919. The current weekly traffic returns would indicate that the omnibuses were carrying daily 500,000 more passengers and the railways 150,000. Fortunately there were more omnibuses for the task. It was estimated that by the end of May, 1919, 450,000 persons would have been demobilised and returned into Greater London, which represented a possibility of traffic of a permanent character.

Up to 1914 the working classes tended to live within easy reach of their work. The munitions industry and Government offices in the Metropolitan area developed in most unlikely places from a transportation point of view. Hence a great deal of cross traffic sprang up, which was compulsory in its nature, was not desired, and helped to create congestion. As the result of a day's census of traffic taken on June 10th, it was found that the Underground electric railways and the omnibuses carried fewer than 260,000 passengers in uniform, amounting to about 8 per cent. of the total traffic, and this was not a day upon which leave was general with the troops stationed in and around London. Lastly, there was no doubt that the population had more money to spend on travel than it ever had. Observations taken at many different times, chiefly in America, tended to show that of a man's income a fixed proportion might be counted upon as spent in travel. If the income went up, or if the cost of travel went down, more journeys were taken. The average increase in the rate of wages of labour up to the present day was 100 per cent. At the same time the average increase in

the cost of living was about 70 per cent. There was a wider margin for expenditure on pleasure. The evidence that pleasure-seeking was the popular pursuit of the moment was apparent on all hands. There were no cheap excursions to take the pleasure seeker outside London; he was congested in the London area. The increase of fares for local transport in London had only reached about 33⅓ per cent., so that it lagged behind the general increase in cost and afforded in itself more opportunity for travel for a given expenditure. It would seem that much of the congestion was due to causes which could not in their nature be permanent. While the traffic must change its character, and might be expected to fall in volume as soon as the state of affairs was completely restored to a peace basis, there was little doubt that it would speedily rise again to its present level, and in certain directions increase beyond it. The Underground group of companies had not shut its eyes to these facts.

Immediate Remedial Measures.

To run more trains not only required more rolling-stock, but more output capacity at the power house. The Lots Road power house was at the moment almost loaded up to its full capacity; the margin was exceedingly small, and in March, 1917, the owning companies endeavoured to secure a priority certificate from the Ministry of Munitions for the purchase of an additional 15,000-kw. set. This priority was only obtained as recently as December, 1918; the set was now being manufactured, and should be installed by the middle of next year. More trains meant more signals and shorter station stops; unless alterations were made concurrently to ensure these, there would be no gain from the acquisition of additional rolling-stock. The signal system of the Underground railways was ahead of the present train working, and many measures had been tried and devices put in execution to shorten the delay at congested stations. More rolling-stock meant more car shops, tools and equipment, and storage sidings. Orders had already been placed for £12,000 worth of new machine tools, and steps were being taken to provide further storage accommodation for both the Bakerloo section of the London Electric Railway and the Metropolitan District Railway.

None the less the crux of the problem remained in new rolling-stock. Prior to the outbreak of war the London Electric Railway Co. and the London and North-Western Railway Co. had jointly on order with the Metropolitan Carriage, Wagon and Finance Co. 60 new cars for the working of the Watford through service. These cars were partly manufactured when war broke out; the work was then put wholly on one side. Since the armistice, negotiations for the completion of these cars were opened and new prices agreed upon to meet the changes in cost occasioned by the war interval, and work was now proceeding, so that delivery might be expected this year. This would release the stock now engaged on the Watford through service. The motor cars, 22 in number, which had been borrowed from the Central London Railway, would be returned and reinstated for use in the through service between Ealing and Liverpool Street over the Ealing extension of the Central London Railway, for which they were originally intended. The trailer cars would become available for the Bakerloo section of the London Electric Railway and would increase the size of the trains worked over this section from five to six cars. The Central London Railway had in its possession at this time 48 trailer car bodies for which bogies only were required. These were being manufactured in this country and would be ready by the time the motor cars were returned by the London Electric Railway to work with them. There was thus ample stock in view to work a liberal relief east and west through service from Ealing to the City over the Central London Railway.

In addition orders for new rolling-stock had been, or were about to be, placed this year as follows:—For the Metropolitan District Railway, 100 cars of new and improved design for the development of the present train services. For the Watford Joint Stock, 12 controlled trailers to permit of the trains on this through service being increased in size from five to six cars. For the London Electric Railway, 40 trailers of an improved type for use on the Piccadilly section to enable the size of trains to be increased from five to six cars also. It was hoped to get deliveries of some of these cars this year.

The work of construction of the Great Western Railway extension of the Central London Railway to Ealing was complete, but it was not electrically equipped and signalled. The manual signalling now installed could be used for the initial services; the electrical equipment of the track and the completion of the sub-stations must, however, be carried out. This might be accomplished within six months, assuming that the necessary labour and materials and machinery were given priority. This route would afford immediate relief to the over-burdened District Railway.

(To be concluded.)

THE SHIPPING, ENGINEERING, AND MACHINERY EXHIBITION.

(Continued from page 476.)

The Roadcraft Engineering Co., Cheapside, Liverpool, exhibits a type T.W. 3-wheel battery truck designed for indoor and local transport of goods. It may be stated that the company, the sole selling agents for which are Messrs. Grosvenor & Co. (London), Ltd., 36, Lime Street, London, E.C.3, will shortly be placing upon the market a 2-ton four-wheeler. The 0.5-ton three-wheeled truck may be summarised shortly as under: Speed when empty 3 to 7 m.p.h., and when loaded 3 to 6 m.p.h. The length over body is 6 ft. 10 in., and of the loading space 5 ft. 3 in. or more to order, the width of the loading space being 3 ft. 1 in., and the height of the platform 1 ft. 10 in. The battery is of the Chloride Ironclad type; the controller gives three speeds, forward and reverse. The brake is of the internal expanding type, and is interlocked with the controller. The drive is by roller chain. The springs are of a heavy spiral pattern and fitted to the back axle; ball bearings are fitted throughout, and the steering is by tiller. All working parts are easy of access, and the makers guarantee to dismember any one of the following, viz., motor, battery, controller, and brakes in three minutes for inspection, adjustment, or for any other reason that would make this operation necessary. The truck is built to withstand rough usage, the axles are of the finest nickel steel, whilst the chassis and other component parts are manufactured from the best steel and steel alloy. The wheels are on double ball bearings with steel rims carrying solid rubber tyres. This little vehicle carrying its load of 12 to 15 cwt. can be used in the most confined place, its turning movement being almost in its own length. In driving, the truck may be headed straight into a wall or other obstacle, and provided the front of the machine has a clearance of 0.5 in. it will turn round without backing, and not strike the wall or other obstacle as the case may be. The battery carries a two years' guarantee, during which time it is inspected periodically by the makers.

The Electrical Appliances Co., Ltd., 7 and 8, Fisher Street, High Holborn, London, W.C. 1, exhibits the "Imperial" vacuum cleaner which operates from any electric light socket or wall plug. It is claimed to be the smallest and most powerful cleaner on the market, also that it oils itself and requires no expert attention; its weight is only 10 lb. Attachments are supplied comprising the following: A carpet brush, which fits on the nozzle of the cleaner, for removing threads, &c., from thick pile carpets; a flat tool for cleaning books, corners, cracks, and such like places; hose for suction or blowing, used to clean curtains, upholstery, &c.; a brush for walls, ceilings, woodwork, and clothing; and a nozzle for cleaning curtains, upholstery, &c.

The Electric Suction Cleaner Co., 56, Victoria Street, Westminster, London, S.W., also exhibits an electric suction cleaner, the "Premier," which is priced at a moderate figure, and each machine is fully guaranteed for 12 months against any defect in manufacture.

Messrs. Scholey & Co., Ltd., 56, Victoria Street, Westminster, London, S.W., in addition to Cope's automatic boiler-feed control apparatus, which is characterised by its simplicity and reliability, exhibits "Kutmore" portable electric drills of entirely British make, which possess some original features, both in electrical design and mechanical construction. The motors are fully enclosed, are air cooled, and quite separate from the gear case. They are suitable for running from either d.c. or a.c. supply. The field coils are of high-grade wire on laminated poles. The armature is built up of

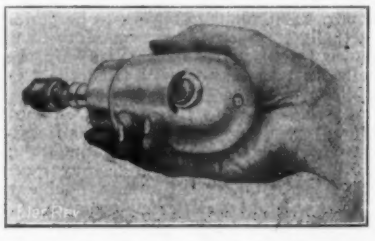

Fig. 22.—Kutmore Electric Drill.

electrical sheet iron, and the insulation throughout is of the highest quality. The commutator is made from hard-drawn bar, to ensure prolonged wear, under spring-controlled carbon brushes. The armature bearings carry a sufficient supply of oil in containers arranged to prevent overflow or splashing. The drill has a one-piece body, carrying a steel spindle which runs in an extra long renewable bronze bush. It has an adjustable ball thrust bearing, automatically lubricated, and is off-set to facilitate drilling in corners. The steel gearing

is accurately machine cut, and runs in heavy grease in the gear case.

The size "O," fig. 22, is claimed to be the smallest portable drill at present on the market; it is single speed, is fitted with a cooling fan inside the motor, is of about 1/12 H.P., runs at 4,000 R.P.M., and consumes about 70 watts. In steel it will drill up to 3/16 in. The No. 1 size has a consumption of 100 watts, is of ¼ H.P., and is claimed to be the only small drill on the market with a 2-speed gear. The speed-change device is very simple, effective, self-locking, and provides for two speeds, the highest 2,300, and the lowest 650 R.P.M. This machine is suitable for drilling up to ¼ in. in steel, and ⅜ in. in brass, wood, &c.

The Quain Electric Co., Ltd., 55, Effra Road, Brixton, London, S.W. 2. The Quain heating element can be applied to every apparatus and process in which any form of heat is utilised; it provides high temperatures, and maintains them at any given degree, up to 1,800 deg. C., without appreciable variation and with no risk of melting or fusing. The element consists of a resistance closely wound upon a hollow support of silica, which is itself enclosed, within a silica casing. The apparatus burns equally well in a vacuum in or out of water, and being relatively small, compact, and simple in structure, it can be adapted for any purpose that the user requires. Only high-grade nichrome wire and specially-graded silica quartz glass are used. Fig. 23 shows a small immersion heater, with a consumption of 200 watts,

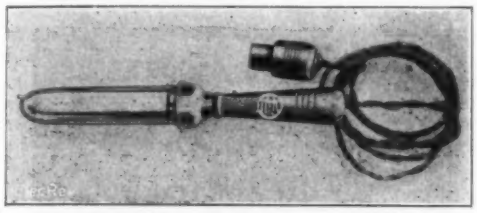

Fig. 23.—A "Thermaglo" Immersion Heater

which can be used for many purposes, from heating shaving water to keeping food simmering; it will not injure food in any way, and is a handy and inexpensive device to have in the house. The larger size, with a consumption of 1,000 watts, may be used for boiling water, sterilisation purposes, and when encased, for liquefying dense oils in cold weather. The multiple-bar fires, of which an example is shown

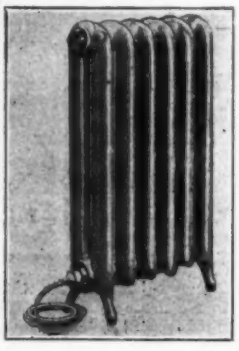

Fig. 24.—An Alloy Fire. Fig. 25.—An Electro-steam Radiator.

in fig. 24, are made either of aluminium alloy or iron, with consumptions of from 1,500 to 3,000 watts. These stoves, it is claimed, give a real radiant heat with high thermal efficiency and the added advantage that the element is protected from wear and tear. It is built of a special alloy, nichrome, which gives a high temperature and long life. Copper and solidly-cast aluminium-alloy kettles are exhibited with capacities of from 2.5 to 4 pints, and consumptions of 500 to 750 watts, to boil in from 10 to 15 minutes. Any existing gas radiators can be easily converted to the "thermaglo" type of heater, which are also said to render low-wattage storage hot-water tanks efficient. Existing hot-water radiators can also be converted as shown in fig. 25; this electro-steam radiator, being gas tight, is attended with perfect safety, and an advantage is its mechanical simplicity and strength.

Messrs. S. G. Leach & Co., Ltd., 26-28, Artillery Lane, London, E.C., exhibits a range of electrically-operated sirens, drills, motors, exhaust, ceiling, desk, and bracked fans, ships' fans, and fan shutters. The sirens are in three sizes, the first, with a sound radius of ¼ mile, is designed for interior use, the single- and double-headed types having a sound radius of several miles. The current consumption of the three designs is respectively 150, 1,700, and 2,500 watts; all three types are manufactured for all conditions of supply. Fig. 26 shows the double-headed "silco" siren, which has a sound radius of two miles, and weighs 350 lb., its approximate size being 52 in. by 25 in. by 25 in. The electric drills are of the portable type, and the different designs show spade-

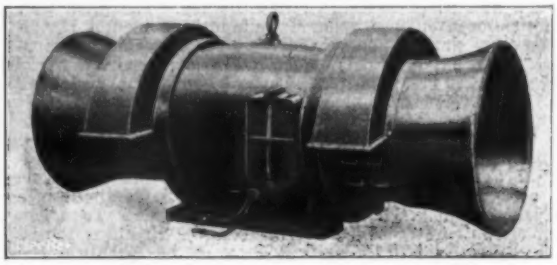

Fig. 26.—An Electric Siren.

handle grip and feed screw characteristics. The motors, of which a sample is shown in fig. 27, include machines which are manufactured in all sizes from 1/30 to 100 H.P. These machines are finished in black enamel; two machines of 1/20 and 1/12 H.P. with aluminium finish are also shown. A complete range of exhaust-fan blades, including 12 to 48-in. box blades, are shown, and also 2- and 3-way patent beedle blades.

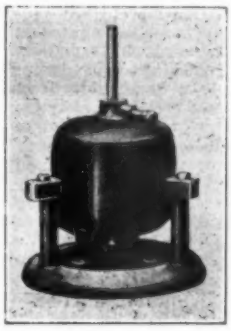

Fig. 27.
A Small Motor.

Fig. 28.
The Bastian "Donkey" Heater.

Various types of fan and small motor regulators, automatic and hand-controlled types of shutters for exhaust fans, and light-type port-hole fans are shown. Shutters shown are 12 in. in size, the louvres being of sheet aluminium.

Messrs. Allen West & Co., Ltd., Lewis Road, Brighton.—The apparatus shown by this firm includes various types of control gear for starting and regulating electric motors to suit specific duties, auto-transformers, combined switches and fuses in cast-iron cases. Lifting magnets and brake solenoids are a speciality of the company's manufactures, and visitors will have an opportunity of viewing an A.W. 36-in. lifting magnet hoisting scrap from a water tank. On the top of the structural work is a spring cable drum used as a take-up to prevent damage to the flexible cable. When the magnet is lowered it winds the spring inside the drum, and upon the magnet being hoisted the drum is driven round by the spring to keep the cable taut. The Allen-West brake solenoids form one of the features of the exhibit, and three types are on view for A.C. (up to 600 volts), and D.C. (up to 600 volts) shunt or series, circuits. The type of magnet blow-out is unique. It is designed to give at each current-breaking point a concentrated and powerful blow-out effect. Wear due to arcing is thus reduced to a minimum, because the circuit can only be broken in an intense magnetic field which instantly disrupts the arc. On A.C. controllers blow-outs are not fitted, as owing to their massive construction and to the circuit being broken at a large number of points, it is found to be quite unnecessary. To insulate the fingers and drum rings, swinging arc shields are provided, these being built up of thick plates of non-hygroscopic arc resisting material, bolter together. In the A.C. controllers an arc shield is only fitted to the larger sizes and then only for the primary circuit. The drum construction is on the mica and iron principle. The spider castings are fitted with copper contacts of heavy section, with arcing tips to reduce the cost of renewals. All the drum bearings are gunmetal bushed, and provided with accessible oil holes. In the case of the larger controllers ball-bearings are provided to take the weight of the drum. In the contactor control gear exhibited the design throughout is based upon the makers'

drum-controller principle, in so far as robustness and massive construction are concerned. A panel is exhibited with push-button control, by which the actual working of the contactors may be seen.

Berry's Electric, Ltd., 86, Newman Street, Oxford Street, London, W.—For domestic purposes the open coal fire has, on account of its cheerfulness and radiance, been the most popular method of heating in this country. The price paid and the inconvenience suffered to indulge a mental phenomenon, the gratification of the optic sense, seems unbelievable. Berry's "Magicoal" electric fire is in effect a living coal fire at its best; the resemblance to an ordinary glowing coal fire is very striking, even the illusion of a flame effect being achieved. This result is obtained (at 1.5d. heating rate per unit), at a cost of less, it is claimed, than the price of burning a wax candle. The glowing effect is produced instantaneously, and a graduated heat, at proportionate cost, can be applied to the fire. The fire has the same appearance at each adjustment, namely, ½, 1, 2, and 3 units. Toast can be made and water boiled. It is not always realised that a coal fire is often burning regardless of the fact that the room is perhaps unoccupied, and irrespective of the temperature, which may change in the course of the day. The "Magicoal" fire is not portable, but its psychological effect has great advantages, and contrary to many radiators, it is most artistic and decorative. The fire can be fitted to any existing grate by filling the latter with separate blocks of silica manufactured to resemble coal. The radiant heat emanates from the bottom, so that the apparently red-hot fire is so cool at the top that pieces of real coal may be sprinkled on it, which remain unconsumed, and complete the illusion.

Whilst electricity, unaided, is under favourable circumstances as cheap as an open coal fire or gas, the best and cheapest system of heating is a combination of centrally produced heat from a coke or anthracite furnace, distributed in pipes by low pressure hot water or steam, to suitable radiators. drum-controller principle, in so far as robustness and massive These radiators when built to resemble a brazier, furnace, or grate, and packed with the "Magicoal" electric fuel, are very realistic and beautiful. The Berry "Colec" system of radiant heating provides for raising the temperature of any room to 55 deg. F., by central coal or coke heating, and provides the top-dressing or last 5 deg. to 10 deg. F. by means of electricity. The result is in advance of anything formerly obtainable; the air, warmed from two independent sources, is pure, clean, and wholesome, while the temperature of the room can be regulated to a degree hitherto unobtainable; the advantage of being able to sit over a radiant fire is also obtained. This firm's "Wun-fire" apparatus provides separate central heating and hot water supply, with only one furnace. The appartus is so constructed that there can be no lime deposited in the boiler, the two waters being separate. It consists of a wrought welded independent boiler, and a wrought welded storage cylinder, joined together by means of a patent flange. The apparatus is easily erected, and there are no working parts to get out of order. A "B" size outfit will supply 29 gal. of hot water per hour, and has 200 sq. ft. of radiation surface; the "E" size, 40 gal., and 340 sq. ft.; and the "H" size, 60 gal. and 453 sq. ft. The connecting pipes are all inside, thereby ensuring positive and rapid circulation. The whole apparatus constitutes a tenant's fixture, and can be quickly erected or removed.

The Bastian Electric Co., Ltd., 185, Wardour Street, London, W. 1, exhibited various types of electric fires, fitted with red-heat quartzalite glowers, specially adapted for use aboard ship. The glowers, "quartzalite" and nickel-chromium resistance wire, are supplied with terminals for screw or spring-clip contacts, and are adaptable for use in any type of fire, radiator, or converter. The fires possess considerable heating capacity, and are rapid in effect, owing to their relatively small weight, being constructed of light sheet and cast metal. The switches may be placed out of sight, but easily accessible from the side, and fires can be supplied with any ornate front desired. Shippers will appreciate the fact that the body of the fire is standardised, while the front is interchangeable. The individual taste of customers can, therefore, be readily satisfied without the necessity of carrying an assorted stock of complete fires. The "Admiralty" type of fire has been supplied to the British and other Navy departments; it is constructed to withstand vibration and shock of heavy gunfire. A handy little heater is the "Donkey," shown in fig. 28, which can be arranged for any capacity desired from 100 to 500 watts, and has been adapted for engine and water heating and numerous applications in the chemical and physical laboratory. The "Gretna" steam-bath hot plate is an application of this heater, of which there are three, 450, 400, and 150 watts respectively. The bath is of copper with brass fittings, and is provided with three copper sockets, into which the heaters slide. The plug and socket system can be applied to kettles, urns, steamers, and water tanks, but is not suitable for saucepans owing to cleaning difficulties.

The Bastian hot-water tank, fig. 29, is a very interesting development, being based upon a novel and carefully thought-out design. It is intended to be left in circuit day and night, and the user is therefore entitled to a very low price for the energy consumed, which requires no meter; the tank is made in three sizes, taking respectively 150, 300 and 600 watts, and giving outputs of 10, 20 or 40 gallons daily of water heated to 150 deg. F. The cost of energy for the 10-gallon size, at 0.75d. per unit, is 18.9d. per week, and it supplies the requirements of a family of five persons. The tank can be coupled to a lampholder, and therefore can be installed at a moderate cost. The water in the tank is always hot, the feed being regulated so that the incoming water cannot lower the temperature of the bulk appreciably, and if no water is drawn off the water does not boil. Moreover, as the temperature is never much higher than 150 deg. F., the water retains its dissolved gases and does not deposit lime, &c. The efficiency of the tank, which is of polished copper, is very high, and increases with the capacity of the tank. This method of securing a continuous supply of hot water has been thoroughly tried out, and experience shows that even if the cost were far greater, the comfort and convenience which it affords would more than compensate for the expense. In a leaflet issued by the firm, some excellent practical advice is given to the user.

In this firm's electric furnace and magnetic detector system for determining the hardening temperature of carbon steel, a delicate indicator is provided to give a signal when magnetic material undergoing heat treatment in a furnace has reached the critical temperature of decalescence. The

Fig. 29.—Bastian Hot-water Tank.

furnace is constructed throughout of non-magnetic material, and a delicate magnetic compass is adjustably mounted on the exterior of the furnace casing. The heat chamber, either tube, muffle, or crucible, is encircled with a wire winding which serves as a magnetising coil, and in the case of electrically-heated furnaces the magnetising coil can also serve as the heating coil. The polarity of the magnetising coil and the position of the furnace in relation to the earth's magnetic field are so correlated that when the furnace is charged with steel the compass is deflected from its normal position by about 90 deg. Directly the steel reaches the change point the compass needle swings steadily back to its former normal position under the influence of the earth's magnetic field, which is much stronger than the stray field from the magnetising coil. The movement of the compass needle can be adapted so as to cause an electric bell to ring, or to automatically discharge the furnace. With a Bastian furnace fitted with the magnetic detector, no pyrometer is required.

Ozonair, Ltd., 96, Victoria Street, London, S.W.1. This firm manufactures apparatus for the commercial production of ozone, and the exhibit comprises apparatus for air purification suitable for rooms or complete buildings, the apparatus being portable and self-contained. A complete demonstration plant of the ozonair system of pure air ventilation is shown in use. The air is drawn by a fan through a washer, where it is cleaned of all impurities, dirt, &c., and cooled or heated to the desired temperature. It is then ozonised and distributed through a series of ducts in the usual manner to the desired points.

Mr. Geo. Palmer, 81, Shaftesbury Avenue, London, W., exhibits and demonstrates his new portable kinematograph outfit, which was described in our issue of August 4th last. The apparatus is compact and self-contained; it is portable and will project pictures on the wall of any room without special preparation or the use of a screen, wherever electric lighting supply is available, it being only necessary to connect the projector to a lamp socket or wall plug. The outfit should be of use in schools, for lectures and all similar educational purposes.

Messrs. Simmonds Bros., Ltd., 4-8, Newton Street, London, W.C., exhibited a selection of "Niphan" couplings and plugs for electric cables which have been devised to enable portable installations to be erected, varied, or removed as required by unskilled labour in the minimum of time, and without tools or waste of materials. The system consists of a set of connectors with branches to each, and plugs to insert in the sockets of the connectors (called couplings). These are attached to lengths of flexible cable, preferably armoured for protection, with plug at one end and socket at the other. On the fuseboard a socket is fixed for each circuit, ready to receive the ends of couplings; the circuits are then built up as required by screwing socket to plug and so on, the socket always being the live end. The system consists of cables with rubber insulation, enclosed in flexible steel tube or armoured cables, which is both fireproof and waterproof. Suitable lengths are made up and a patent mechanical coupling fixed on each end, so that any desired length of run can be effected, and fittings connected wherever necessary. The tubing forms, with the couplings, a continuous metallic armouring easily connected to earth. The most important feature of the system is the coupling. The case is of brass, in two parts connected by a screwed and milled ring. The insulating material is ebonite, and the terminals gunmetal. Each socket is provided with a small tapered pin which enters a hole in the plug, which is split, thus spreading out the latter when home, and pressing it against the sides of the interior of the socket hole. This ensures an increased area of contact. To wire lamps in series, a series connector can be inserted between the two halves of the coupling, or a series coupling used. Everything being interchangeable, any number of combinations can be made by using the tee couplings. Unskilled labour may be used, tools being unnecessary. The system can be connected up like a fire hose, as fast as unrolled; no fitting in the ordinary sense of the word being required. The flexible nature of the system does away with the necessity of bends, and great economies result in first costs. Further, the advantages of a permanent installation are retained, and the rules of the Institution of Electrical Engineers conformed to.

Messrs. Fyfe, Wilson & Co., 31, Budge Row, Cannon Street, London, E.C.4, exhibit a portable 6-kw. generating set consisting of a 4-cylinder internal-combustion engine direct coupled to a 100-amp. 60-volt dynamo. The set is specially designed for use on a lorry or any class of work where portability is essential. The 3-kw. set shown consists of a 2-cylinder engine direct coupled to a 50-amp. 60-volt dynamo, and is arranged for tank cooling, the thermo-siphon system being used. Pumping plant is also on view, and attention is drawn to the fact that the whole of the plant is standard, and has been successful in connection with arc welding, country house lighting, &c.; the sizes range up to 60 kw. The "Idobuff" polishing motor exhibited by this firm has been specially designed for jewellers' and silversmiths' requirements. The motor has a continuous rating of 0.5 h.p. at 200/250 volts d.c., and runs at 2,250 r.p.m., but this may be exceeded by 50 per cent. for short periods. The spindle is mounted on dust-proof "Hoffman" ball bearings. The commutator is made of h.c. copper, insulated with compressed mica, and both armature and field windings are thoroughly impregnated. The brushes are of graphitic carbon, and the brush holders are constructed entirely of brass with flat phosphor-bronze springs. The switch is enclosed in the base, being of a d.p. fool-proof type.

Messrs. Matthews & Yates, Ltd., Swinton. This exhibit comprises various sizes and types of blowers, exhausters, and fans, both mechanically and electrically driven, the latter for direct current and all standard voltages. An electric vacuum cleaner suitable for all standard voltages, either direct or alternating current, is also shown.

(To be continued.)

Cardiff as a Centre for New Works.—Under the auspices of the Development Committee of the Cardiff City Council, a book has been published setting forth the merits of Cardiff as a centre for commercial and industrial development. Manufacturers are invited to consider its claims when contemplating extension of their operations. The contents set forth particulars of the import and export trade, railway, dock, and other shipping facilities, public electric, gas, and water services, existing industries, warehouse accommodation, &c. Many photographic views appear of public buildings and undertakings, industrial, water and shipping, and of the general attractions of the city and district. The book is published by the Business Statistics Co., Ltd., of Baltic House, Cardiff.

DIRECTION FINDING BY WIRELESS TELEGRAPHY.

By CAPT. H. R. SANKEY, C.B., R.E. (ret.).

(Abstract of lecture delivered at the Shipping Exhibition.)

An early pattern of direction-finder known as the Marconi-Bellini-Tosi radiogoniometer was used in conjunction with open aerials and relied upon mechanically-operated balanced electrical capacities or condensers. An important advance was made when the Marconi Co. adopted the closed aerial circuit, now in general use, and replaced the mechanically balanced capacities by independent condensers capable of exact balance. A great increase in range followed the introduction of the Marconi-Round receiving valve in 1913-14, after which the direction-finder came into prominence as an instrument of war.

In January, 1915, Capt. Round and Lieut. Tremellyn established experimental military direction-finding stations at St. Omer and Abbeville which were destined to be the forerunners of a very large number of similar stations. We were able to ascertain the direction of known wireless stations within a degree or two, and were able to locate many German military wireless stations. From this beginning rapid strides have been made, as regards both accuracy and range; during the last four years the wireless direction-finder has been put to special uses peculiar to a state of war, and in this sphere it has abundantly proved its value. At the war stations

Fig. 1.—Admiralty Direction-finding Stations (Marconi).

installed by the Marconi Co. it was in constant use day and night until the cessation of hostilities, and as a result an accumulated fund of information based on actual working is now available.

In the hands of the British the direction-finder was of value in guiding aircraft and in locating enemy wireless installations on land, at sea, and in the air. A number of special stations were erected at selected points on the coast and elsewhere, and these worked in pairs or in groups. The individual stations of a group observed, at the same moment the direction of a particular moving enemy station, and reported immediately to headquarters, where, by means of a chart, the observations were combined, and the position of the enemy was ascertained at once. The whole operation required but a few minutes. Fig. 1 shows the location of such of these stations as are now open for public service.

The German warships, submarines, and Zeppelins were invariably equipped with wireless, which was used somewhat freely. It was thus possible to follow them up pretty closely, and much valuable information was gained in this manner.

The wireless direction-finder has been used in two distinct ways: On the ground in fixed positions, and in a ship or aircraft. The British have used both methods for ship and for aerial navigation. The Germans, on the other hand, appear to have relied upon fixed direction-finding stations, placed on the islands off their coast and in occupied territory, for directing their Zeppelins as well as surface craft and sub-

marines. From the military point of view our war system of aeral navigation possessed an obvious advantage, since it enabled a ship or an aeroplane to ascertain its position unknown to the enemy and without advising him of its whereabouts.

The advent of the three-electrode valve and its successful application to the reception of wireless signals has resulted in the production of a detector of extreme sensitiveness, by means of which enormously increased ranges are obtained, and smaller aerials can be used, which can be erected on the average ship. Under such conditions the detector will pick up signals from another ship or from a standard low-power shore station 500 miles away—a distance very much in excess

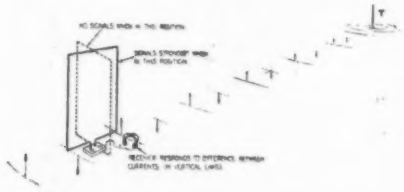

Fig. 2.—Method of Revolving Aerials.

of that necessary for ordinary direction-finding work. Extremely large aerials, therefore, are no longer necessary. To obviate the need of highly skilled personnel a new and greatly simplified pattern of direction-finder has been developed by the Marconi Co.

A ship or aeroplane without direction-finding gear, when wishing to ascertain its position must call up the fixed direction-finding stations within range, await an acknowledgment, and possibly wait its turn before sending out repeatedly the prearranged signal, by means of which the land stations are able to ascertain its position. There will then be an interval while the bearings are communicated by ordinary telegraph

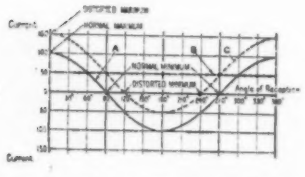

Fig. 3.—Cosine Curves Showing Dilution and Distortion.

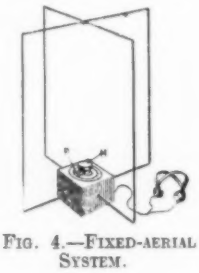

Fig. 4.—Fixed-aerial System.

or telephone to the controlling station, and the ship's position worked out, after which the ship is advised by wireless of its position, and the message is acknowledged.

In view of the great increase in wireless traffic with ships and the growth of traffic wth aircraft which will assuredly take place in the future, any system of working which involves prolonged signalling is clearly at a disadvantage. Apart from the question of jamming, the actual time during which the transmitting gear is commercially inoperative must be taken into consideration when traffic is heavy, as it very well may be at the time when directional readings are required.

If, however, the direction-finding apparatus is on the ship, the operator can take bearings by merely listening on the

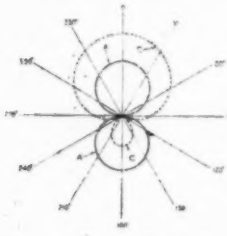

Fig. 5.—Polar Diagram.

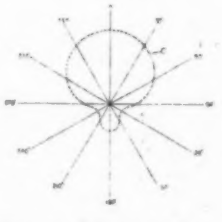

Fig. 6.—Effect of Phase Difference.

direction-finder and noting the direction of known stations which happen to be working at the moment. Ships and aircraft carrying their own direction-finding gear can therefore ascertain their positions without interfering in any way with the normal wireless traffic in busy times. When traffic is light, any desired station may be called up, and its direction ascertained from the signals sent in reply.

I now propose to describe briefly the principle of the wireless direction-finder.

If we have two conductors or "aerials" fairly close together, both receiving electric waves from the same source, it is easy to realise that by moving one aerial in relation to the other we can form an idea as to the direction of the wireless station from which the waves are emanating. If two such aerials be placed one behind the other with respect to the transmitting station, the currents in one will always be a little later than those in the other. On the other hand, if the aerials are side by side, *i.e.*, at an equal distance from the transmitting station, they will be struck at the same instant by each wave as it sweeps past, and there will be no difference in time between the two currents. In intermediate positions we shall obtain intermediate results. Thus, a full comparison between the currents in a fixed or a movable aerial, or in two movable aerials, would enable us to estimate the direction of the transmitting station.

The means of comparison is simple (fig. 2). The two aerials are connected together at their upper and lower ends, so as to form one aerial, shaped as a rectangle or triangle, and in the lower limbs a receiver is coupled. In this position the receiver responds to the difference between the currents in the vertical limbs which we have so far regarded as separate aerials.

When the horizontal limb is set at right angles to the direction of the transmitting station no signals will be heard, since the current in the vertical sides of the rectangle, or the sloping sides of the triangle are exactly equal and annul each other. As the aerial is twisted round so that one limb

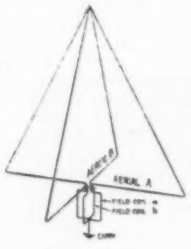

Fig. 7.
Method of Connecting Aerials and Field Coils.

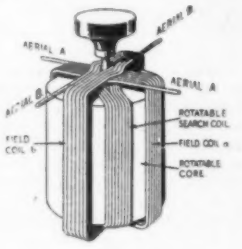

Fig. 8.
Arrangement of Coils in the Direction-finder.

comes nearer the source of the waves, and the other becomes more remote, the signals increase in strength until a maximum is reached when the rectangle or triangle points towards the transmitting station.

It is a *sine qud non* that the directional reading shall be taken with rapidity; hence, if for no other reason, large and unwieldy movable aerials cannot be used. In the system which is coming into general use two independent triangular or rectangular fixed aerials are erected with their planes at right angles, and connected to an instrument which may

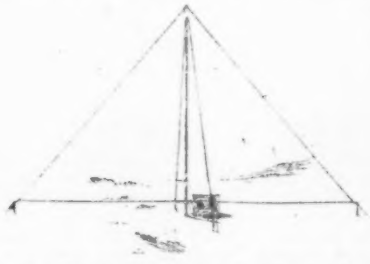

Fig. 9.—Direction-finding Station on Land.

be said to reproduce the external conditions in a small space. A "search coil" of quite small dimensions which is within the instrument, may be regarded as a diminutive direction-finding aerial under the influence of the large fixed aerials. Rotation of the coil is equivalent to the rotation of a large aerial, but its size and weight are such that it can be manipulated in the convenient manner necessary for quick and accurate work.

Small movable aerials are unsuitable, because in all directional aerials the directional effect is diluted more or less by a non-directional component, and in very small aerials the directional effect is seriously masked by this component; also with very small aerials enormous amplification of signals must be resorted to, and as a result further dilution takes place owing to an appreciable proportion of the energy being received directly upon the connecting leads and receiving gear.

This dilution of the directional effect is worse than would appear at first sight. It not only masks the phenomena we are depending on, but it actually distorts the readings, and alters the relative positions for minimum and maximum signal strengths.

In fig. 3 curve A represents the current which would be received by an aerial having directional properties only. B represents the diluting current due to the non-directional component, and to the direct reception by the connecting leads and gear, and C is the algebraic sum, *i.e.*, the resultant of A and B. It will be seen that the effect of B is to increase one maximum while decreasing the other, and to distort both minima.

In fig. 5 the curves A and C are set out on a polar diagram which very clearly illustrates the distortion effect. In practice a difference in phase exists between the directional currents and the diluting currents, with the result that the minima become vague and ill-defined, and the diagram assumes the thoroughly unsatisfactory shape indicated in fig. 6.

Modern Direction-finding Apparatus.

In the apparatus I shall now describe the aerials are fixed, and the readings are taken by rotating a small handle as diagrammatically illustrated in fig. 4. Inside the box seen in this figure there are two fixed coils known as field coils. These are mounted in planes at right angles and connected to the aerials as indicated in fig. 7. Within the fixed field coils is a rotatable search coil diagrammatically illustrated in fig. 8.

The function of this portion of the apparatus is to combine the signals received on the two aerials in such a manner that the movable search coil is influenced by them when it lies in a plane corresponding to the direction from which the signals are received, and is unaffected when it lies in a plane at right angles to that direction.

Each aerial receives best from a transmitting station in its own plane. Thus if the sending station lies in the plane of the aerial A, the aerial B will receive nothing, and the search coil must lie in the plane of the field coil *a* to receive signals of maximum strength. If, under these conditions, the search coil lies in the plane of the field coil *b*, it will receive no signals. If the sending station is in the plane of the aerial B the conditions will be reversed.

When the sending station lies in a direction which is not directly in the plane of either aerial, both receive signals, and the strength in each is proportional to the cosine of the angle between the direction of the sending station and the plane of the aerial. It follows that when this occurs the two field coils act in the same way as an imaginary fixed field coil in a position intermediate between *a* and *b* corresponding to the direction from which the signals are received. In other words, as already pointed out, the two fixed aerials A and B, with their corresponding fixed field coils *a* and *b*, are equivalent to an imaginary movable system, consisting of one field coil and one aerial, which automatically adjusts itself to lie in the plane of the incoming signals.

The direction of the sending station can be ascertained, therefore, by rotating the search coil until the signals are of maximum or minimum strength and noting its position. In practice the minimum is used, since it is more sharply defined.

A standard modern direction-finding installation comprises the following, with appropriate auxiliary gear, such as batteries and telephones: A special aerial system; the direction-finder coils and pointer; a special transformer; and the detector.

Where space is a secondary consideration, as is usually the case in permanent land stations, large aerials may be used, and the components, together with the necessary auxiliaries, can be installed as separate units. For use on board ship and in aircraft special aerial systems are provided to suit individual cases, and the remaining components may be arranged in a compact form as one unit.

The installation I am about to describe is for use on land, and has its components arranged as separate units.

Fig. 9 is a sketch of an actual station, and as it is drawn to scale it gives an accurate idea of the proportions of the aerial system. This comprises one 90-ft. central mast supporting two triangular aerials with inclined limbs 110 ft. long, and horizontal limbs 144 ft. long. The latter are broken at their centres and led down to the instruments. Fig. 10 is a view of the gear inside the wireless cabin.

The external appearance of the direction-finder box is illustrated in fig. 11. Fig. 12 is a view showing the inside, and fig. 13 a diagram of the connections.

In the land pattern direction-finder the two aerial circuits are tuned by means of separate condensers which are connected to the terminals B C and F G. By tuning is meant that the circuits are adjusted to oscillate at the same frequency as the incoming wave.

The field coils *a* and *b*, fig. 13, are each connected in circuit with one of the aerials by means of the terminals A D and E H. These coils are split at their centres, whence leads are taken to the terminals B C and F G, thus enabling the condensers to be connected at points of symmetry in the aerial system. In the space within the coils is mounted the rotatable search coil S, which is connected to the detector through a special transformer.

As will be seen in figs. 11 and 12 the search coil is mounted upon a vertical spindle provided with a handle and pointer which moves over a fixed scale graduated in degrees. For use on land it is arranged that 0 deg. on this scale is the minimum point for signals received from stations on a line running true north and south from the direction-finder. On ships and in aircraft, 0 deg. is the minimum point for stations on a line directly ahead and astern. It should be noted that when once the circuits are tuned and the aerials balanced, one half of the scale only need be used, for, as it makes no

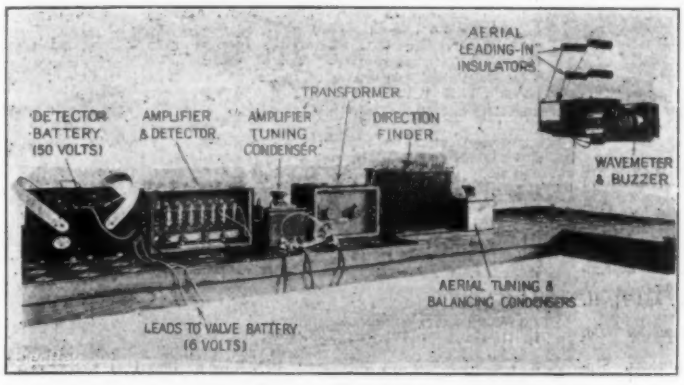

Fig. 10.—Interior of Cabin (Land D.F. Station).

Fig. 12.—Interior of Direction-finder.

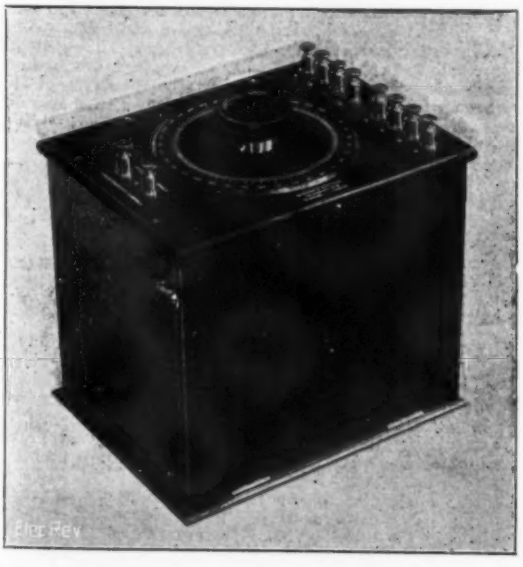

Fig. 11.—Land Pattern Direction-finder.

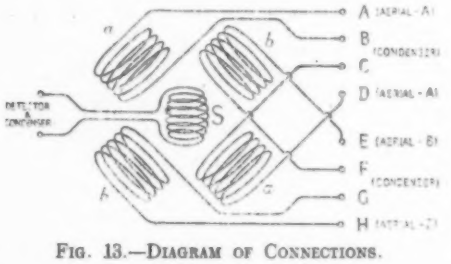

Fig. 13.—Diagram of Connections.

difference which way round the search coil may be so long as it lies in the desired plane, opposite points on the scale are equivalent. Thus in the standard instrument on board ship, for example, signals from dead ahead are of minimum strength when the pointer is at 0 deg. and also when it is at 180 deg., and they are full strength when the pointer is at 90 deg. or 270 deg.

From a consideration of the foregoing, it will be realised that the standard direction-finder indicates direction, but not what is mathematically termed "sense," *i.e.*, it enables the operator to ascertain that a given station is on a line running north and south, for example, but gives no indications as to whether it lies to the north or to the south. In practice this peculiarity does not detract from the value of the instrument except in the special case of one ship or aircraft being desirous of ascertaining, with great rapidity, the relative course of another. In such a case, if wireless communication can be obtained, a combination with the direction-finder reading will give the required information.

(To be concluded.)

NEW PATENTS APPLIED FOR, 1919.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens (successors to W. P. Thompson & Co., of London), Chartered Patent Agents, 285, High Holborn, London, W.C. 1.

23,844. "Means for ignition in motors, &c." D. Marshall. September 29th.

23,845. "Electrically-operated diaphragm." I. H. Parsons. September 29th.

23,873. "Conduits for electric wires." F. W. Berwick & Co. and M. H. L. Sizaire. September 29th.

23,876. "Motor control systems." British Thomson-Houston Co. (General Electric Co.) September 29th.

23,891. "Detection of electrically conducting bodies." S. Ruzicka. September 29th.

23,906. "Anti-parasitic receiving and selecting system for telegraphy and telephony." L. Levy. September 29th. (France, October 1st, 1918.)

23,924. "Magnetos for internal-combustion engines." A. H. Boulton. September 30th.

23,928. "Electric motors and dynamos." W. Stirling. September 30th.

23,933. "Apparatus for closing circuit for a certain period." S. de Prokudine-Gorsky. September 30th. (Norway, November 8th, 1918.)

23,949. "Electrode and process of making same." W. H. Boorne. September 30th.

23,952. "Terminals and connections for electric cables, terminals, &c." J. Hanman. September 30th.

23,955. "Insulators for fixing electric cables to walls, &c." V. Tedeschi. September 30th. (Italy, December 5th, 1918.)

23,956. "Insulators for fixing electric cables to walls, &c." V. Tedeschi. September 30th. (Italy, February 18th.)

23,976. "Means for regulating voltage of self-excited generators." P. P. Eckersley and C. E. Prince. September 30th.

23,977. "Contact-breakers for high-tension magnetos." A. Anzani. September 30th. (France, October 2nd, 1918.)

23,978. "Contact-breakers for high-tension magnetos." A. Anzani. September 30th. (France, October 9th, 1918.)

23,979. "Wireless telephone apparatus." P. L. Douvry. September 30th.

23,981. "Directional wireless installations." A. E. Eayres-Gardner. September 30th.

24,027. "Electric storage batteries." E. C. R. Marks. (Koehler Manufacturing Co.) October 1st.

24,028. "Electrical system of train communication." E. C. R. Marks. (Macfarlane Communications Corporation.) October 1st.

24,064. "Sound-increasing apparatus for telephone receivers." E. R. Royston. (Chadburn [Ship] Telegraph Co.) October 2nd.

24,074. "Safety appliance for heating electric irons." D. Donaldson. October 2nd.

24,075. "Magnetic lock." J. Mackie. October 2nd.

24,080. "Starters and controllers for alternating-current induction motors." R. H. Barbour. October 2nd.

24,103. "Mechanism for operation of electric switches." H. J. Thomson. October 2nd.

24,105. "Alternating-current dynamo-electric machines." British Thomson-Houston Co. and H. W. Taylor. October 2nd.

24,106. "Static electric condensers." British Thomson-Houston Co. and R. C. Clinker. October 2nd.

24,114. "Electric lamps." E. C. R. Marks. (Koehler Manufacturing Co.) October 2nd.

24,115. "Electrical system of communication." E. C. R. Marks. (Macfarlane Communications Corporation.) October 2nd.

24,121. "Electric ignition apparatus." American Bosch Magneto Corporation. October 2nd (United States, October 1st, 1918.)

24,130. "Brush holders for magnetos." American Bosch Magneto Corporation. October 2nd. (United States, October 26th, 1918.)

24,154. "Sparking plugs." C. F. Burton. October 3rd.

24,164. "Fitment for attaching magnets to engine." R. M. S. Morgan, D. S. B. Shannon and W. J. Shepherd. October 3rd.

24,173. "Electric transmission signalling systems." Western Electric Co. (Western Electric Co.) October 3rd.

24,197. "Electric lamps." E. G. Mascarenhas. October 3rd.

24,199. "Electric heating and lighting." J. R. Quain. October 3rd.

24,214. "Sound-reproducers for gramophones and telephones." R. A. Dirdin, G. H. Glover and Resonance, Ltd. October 3rd.

24,224. "Magnetos." W. J. Mellersh-Jackson. (American Bosch Magneto Corporation.) October 3rd.

24,243. "Magnetically-operated friction clutches." C. F. Shanks and M. Walker. October 4th.

24,246. "Electric heating apparatus." C. H. Archer and Automatic Telephone Manufacturing Co. October 4th.

24,267. "Electric cooker and heater." E. G. Pilgrim. October 4th.

24,290. "Telephonic apparatus." E. A. Graham. October 4th.

PUBLISHED SPECIFICATIONS.

The numbers in parenthesis are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1918.

3,303. Variable electric resistances or rheostats. Siemens & Halske Akt. Ges. February 15th, 1917. (114,148.)

8,029. Magnetos. Compagnie Generale de Magnetos. October 1st, 1917. (132,284.)

9,615. Diaphragm or like vibrators. W. J. Mellersh-Jackson. (Submarine Signal Co.) June 11th, 1918. (132,292.)

9,648. Automatic safety control for kinematograph and like machines. R. M. Geyer. June 12th, 1918. (132,293.)

10,477. Wireless telegraphy or telephony. Naamlooze Vennootschap de Nederlandsche Thermo-Telephoon Maatschappij. July 12th, 1917. (Addition to 3,954/15.) (118,600.)

13,411. Electrically-ignited lighting device. P. Elphick. February 6th, 1919. (132,315.)

14,510. Electric arc lamps. W. T. Coulson. September 6th, 1918. (132,324.)

14,703. Radiant energy signalling systems. T. W. Case. September 10th, 1918. (132,341.)

14,857. Electrodes for electric-arc welding and metal cutting purposes. W. H. Boorne. September 12th, 1918. (132,354.)

15,073. Alternating current motors. W. F. Higgs and D. D. Rayner. September 17th, 1918 (132,362.)

15,178. Apparatus for electrically operating and controlling railway points. A. Monard. November 8th, 1917. (120,553.)

18,077. Electro-magnetic wave reception systems. J. Robinson. November 4th, 1918. (132,391.)

20,411. Electrically-driven vehicles. J. E. Stott. December 9th, 1918. (132,413.)

20,547. Devices of the vibrated diaphragm type for giving audible signals. M. A. Codd. December 10th, 1918. (132,414.)

21,310. Insulators for high-tension electric cables. H. Wade. (Fabbrica Isolatori Livorno.) December 19th, 1918. (132,417.)

1919.

1,755. Telephone systems. B. S. Cohen. January 23rd, 1919. (132,429.)

3,355. Receiving circuits for wireless telegraphy. H. J. J. M. de Regnauld de Bellescize. June 26th, 1917. (132,434.)

3,462. Receiving circuits for wireless telegraphy. H. J. J. M. de Regnauld de Bellescize. April 29th, 1918. (Addition to 3,355/19.) (132,435.)

4,755. Telegraph systems. Automatic Telephone Manufacturing Co. and H. H. Harrison. February 26th, 1919. (132,442.)

8,209. Multiple-control apparatus for electric railways with motor-driven main-switch drums. Akt. Ges. Brown, Boveri et Cie. May 3rd 1918. (126,278.)

9,176. Apparatus for electrically igniting miners' safety lamps. V. E. Joyce and Park Royal Engineering Works. April 10th, 1919. (132,460.)

14,734. Junction boxes for electrical conduits. A. W. Sclater. June 11th, 1919. (132,479.)

16,843. Electric batteries. L. Rubinovitch and A. Mond. July 8th, 1918. (Divided application 11,181/18.) (132,480.)

18,801. Means for making temporary connections with electric supply cables. J. H. Collie. August 13th, 1918. (Divided application of 13,104/18.) (132,482.)

Opening for British Trade.—New Zealand.—According to the *Board of Trade Journal* the officer in charge of H.M. Government office in New Zealand reports the following enquiries: A Wellington firm desire to secure agencies for electrical goods, cables, and wire, &c. The firm work on a commission basis, and propose to book orders in the name of their principals, who would draw for payment direct on buyers on sight draft terms. The firm have been representing American manufacturers, but would be prepared to relinquish such agencies in favour of British, as opportunities occur. They claim to have good connections, employing a large staff of salesmen, and have permanent sample rooms in all the main centres of the Dominion. (Reference No. 798.)

An agent at Wellington desires to obtain agencies for United Kingdom manufacturers of electrical insulating material, insulated cables and wire, electrical fittings of all kinds, pyrometers, and electric welders. (Reference No. 799.)

Replies should be addressed to the Department of Overseas Trade, in London.

Electrical Goods for South Africa.—In its issue for September 20th the *South African Mining and Engineering Journal* says: "What immediately concerns the electrical world of Johannesburg is the present dearth of screw (threaded) tubing, which is used underground. In lieu thereof contractors are being forced to use water piping at present. Other materials are coming in fairly freely. A prominent dealer mentioned that a large Capetown firm had wired him an order, amounting to about £3,000, for heavy cables, &c. He presumed that the materials were wanted either for the tramways or the municipality. However, he could not supply a tithe of the order, nor were his inquiries in Johannesburg, &c., of any avail towards executing the order. This instance, with others previously mentioned by us, of the coast applying to Johannesburg for materials, is an apt illustration of the present upside down condition of things commercially. Business for electrical material on the Exchange has been quiet during the week, as the mines have not been buying heavily just now. There are only small shipments of electrical goods on the water, but it is generally expected that in the near future heavy consignments will be dumped here from Germany at prices much below English, American, and Japanese. As a matter of fact, it is an open secret that the dumping has already commenced, as the fact that materials already to hand, bearing the trade mark 'Made in Holland,' leaves little to the imagination as to the real country of origin."